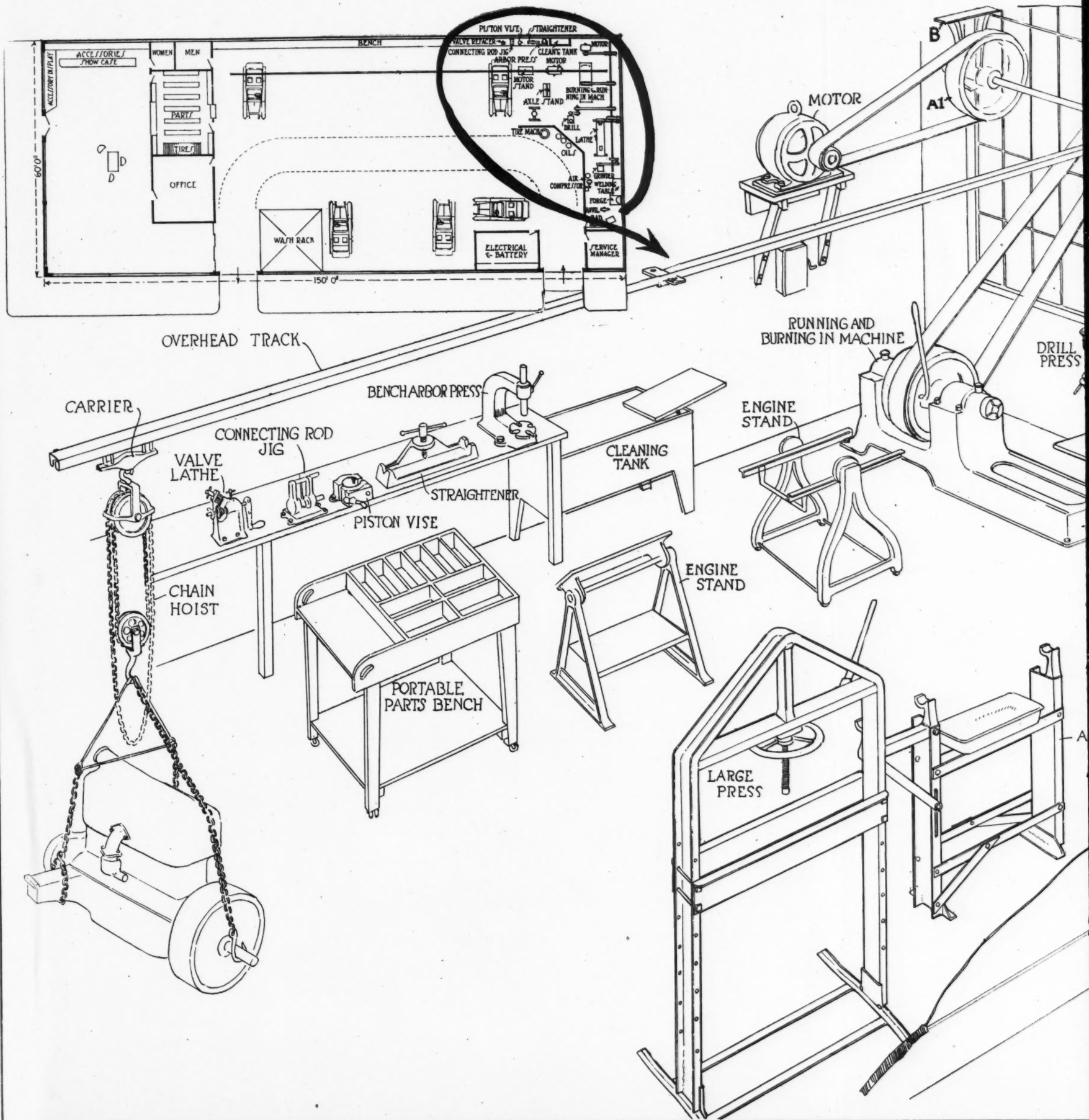


Layout for Machi



at for Machine Tool Equipment of Ideal Serv



Service Station for Average Town

Showing at a Glance the Machines and Equipment Needed for Rendering Quick, Economical and Efficient Service — Practically Any Job Can Be Handled in a Shop Like This

Points to Observers In Selecting

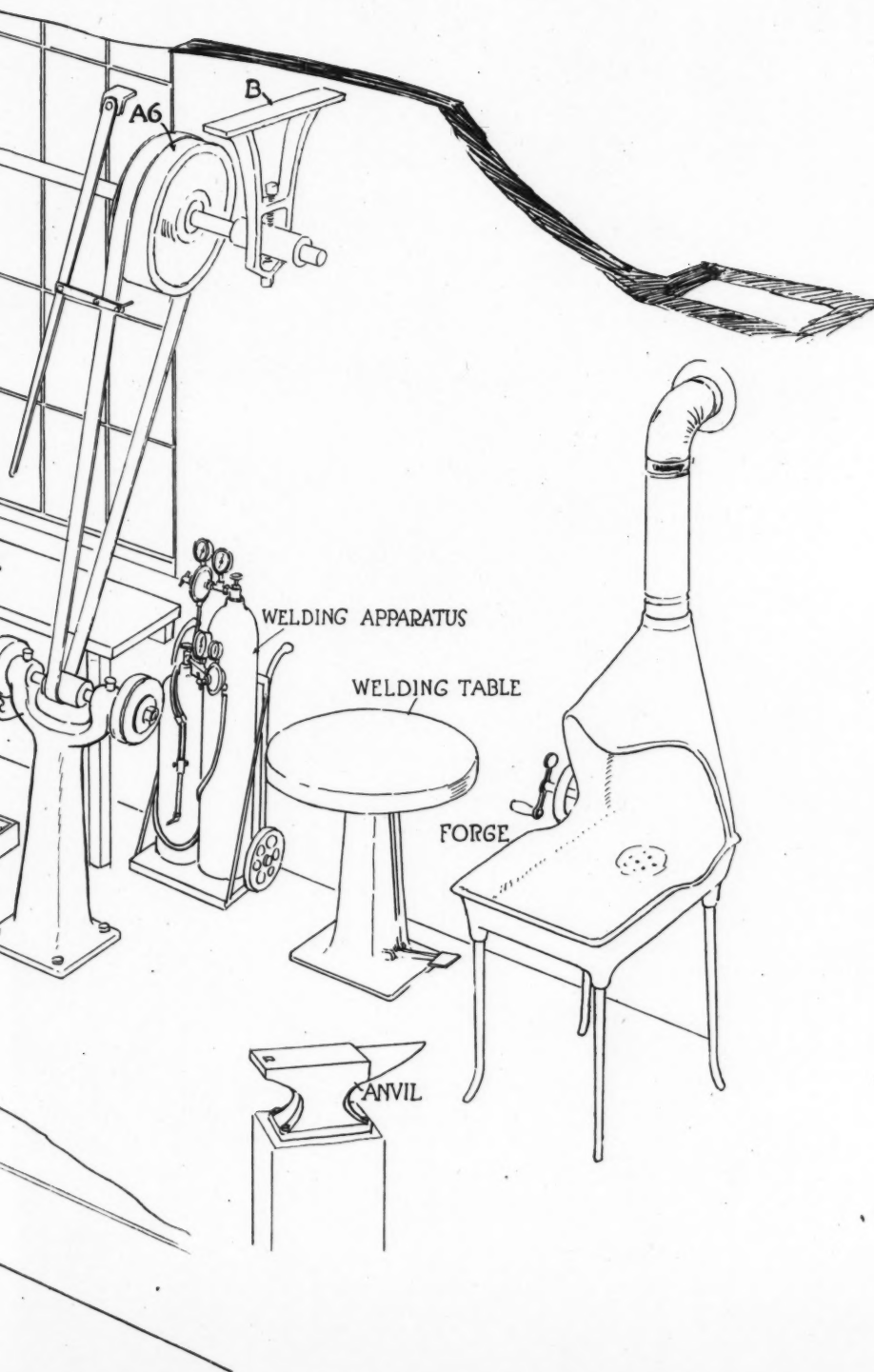
THIS insert shows an enlarged perspective view of the shop n and which was used in describing the ideal service station Motor Age. In other issues we shall feature the electrical depa the job, etc., so that the dealer about to enlarge his place or the guided in his purchases and fitting out by these articles.

The prices given for the equipment on this page are app will vary somewhat in other parts of the country. However, th for his estimates.

In laying out this repairshop the idea has been to use the conditions. Definite dimensions in regard to the machine place drill presses, etc., will occupy different floor space. The best th sizes as the bases of the machines and then place these in varying been obtained.

In figuring the floor space of any machine, care must be machine or for the work it is to handle. For instance, in placing that if long rods or bars are to be worked, sufficient room mus be no interference, as would happen if the lathe were pl'ced in a

In this layout we have shown the air compressor d iven by line shaft. The first cost of a 2-hp. electric motor required to d believe this will be absorbed in the saving of current. Further ing and stopping, which cannot be done when the outfit is drive pressed air all the time, but it is not economy to keep a 10 or 15



Machine Tool and Equipment

Line shaft, 30 ft. long, 1½ in. diameter.....	
Adjustable hangers	
Electric motor, 10 hp.	
Lathe countershaft.....	Included in lathe price
Burning and running-in machine with fittings.....	
Drill press, 14-in.	
Lathe, 11¼-in. swing over carriage.....	
Grinder	
Welding table	
Forge	
Welding apparatus	
Anvil	
Air compressor outfit	
Axle stand	
Engine stand	
Engine stand	
Overhead track, 100 ft. with brackets	
Overhead carrier and hoist	
Valve lathe	
Connecting rod jig	
Piston vise	
Crankshaft straightener	
Bench arbor press	
Cleaning tank	
Large press	

Total

Ideal Service Station for Average Town

Showing at a Glance the Machines and Equipment Needed for Rendering Quick, Economical and Efficient Service — Practically Any Job Can Be Handled in a Shop Like This

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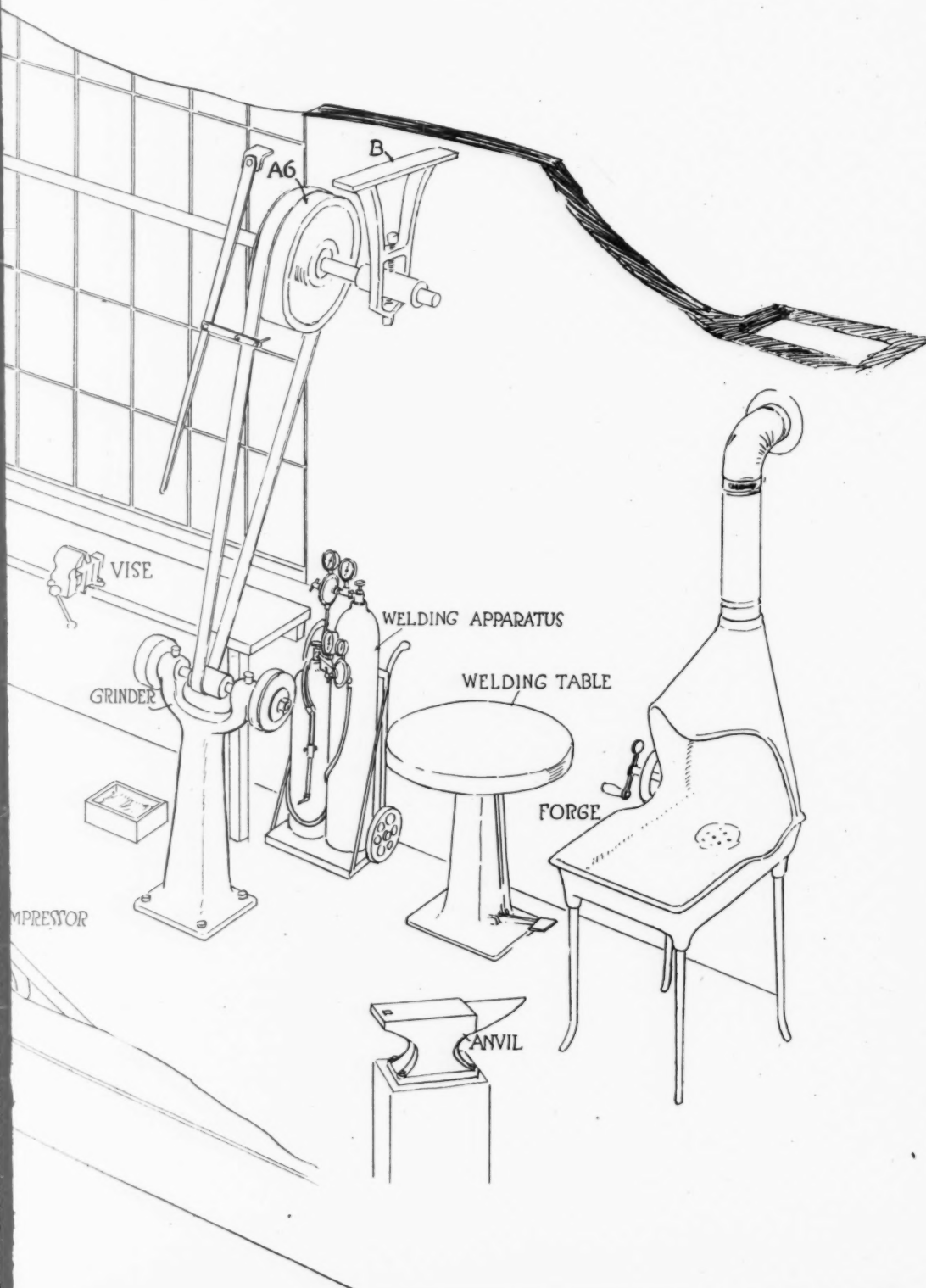
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Line shaft, 30 ft. long
Adjustable hangers
Electric motor, 10 hp
Lathe countershaft...
Burning and running
Drill press, 14-in. ...
Lathe, 11 1/4-in. swing
Grinder
Welding table
Forge
Welding apparatus
Anvil
Air compressor outfit
Axle stand
Engine stand
Engine stand
Overhead track, 100 ft.
Overhead carrier and
Valve lathe
Connecting rod jig
Piston vise
Crankshaft straightener
Bench arbor press
Cleaning tank
Large press

Total

Points to Observers In Selecting the Shop Equipment

insert shows an enlarged perspective view of the shop machinery set-up as given in the small plan view which was used in describing the ideal service station for the average town in the Sept. 11 issue of *Engineering News-Record*. In other issues we shall feature the electrical department of such an establishment, the routing of pipes, etc., so that the dealer about to enlarge his place or the dealer expecting to put up a new building can be guided in his purchases and fitting out by these articles.

The prices given for the equipment on this page are approximate for Chicago and vicinity but naturally vary somewhat in other parts of the country. However, they can be taken by the dealer anywhere as a basis of estimates.

In laying out this repairshop the idea has been to use the least floor space consistent with good operating conditions. Definite dimensions in regard to the machine placement cannot be given, as various makes of lathes, grinders, etc., will occupy different floor space. The best thing to do is to cut paper templates of the same size as the bases of the machines and then place these in varying positions on the floor until the best layout has been obtained.

In figuring the floor space of any machine, care must be used to allow for any projecting parts of such a machine or for the work it is to handle. For instance, in placing the lathe and drill press, it must be remembered that long rods or bars are to be worked, sufficient room must be allowed around the machines so there will be no interference, as would happen if the lathe were placed in a corner.

In this layout we have shown the air compressor driven by an individual electric motor instead of from the main line shaft. The first cost of a 2-hp. electric motor required to drive the compressor will be a little more, but we think this will be absorbed in the saving of current. Furthermore, there is the advantage of automatic start-stopping, which cannot be done when the outfit is driven off the line shaft. A service station needs compressed air all the time, but it is not economy to keep a 10 or 15-hp. motor going just for the air line.

Machine Tool and Equipment

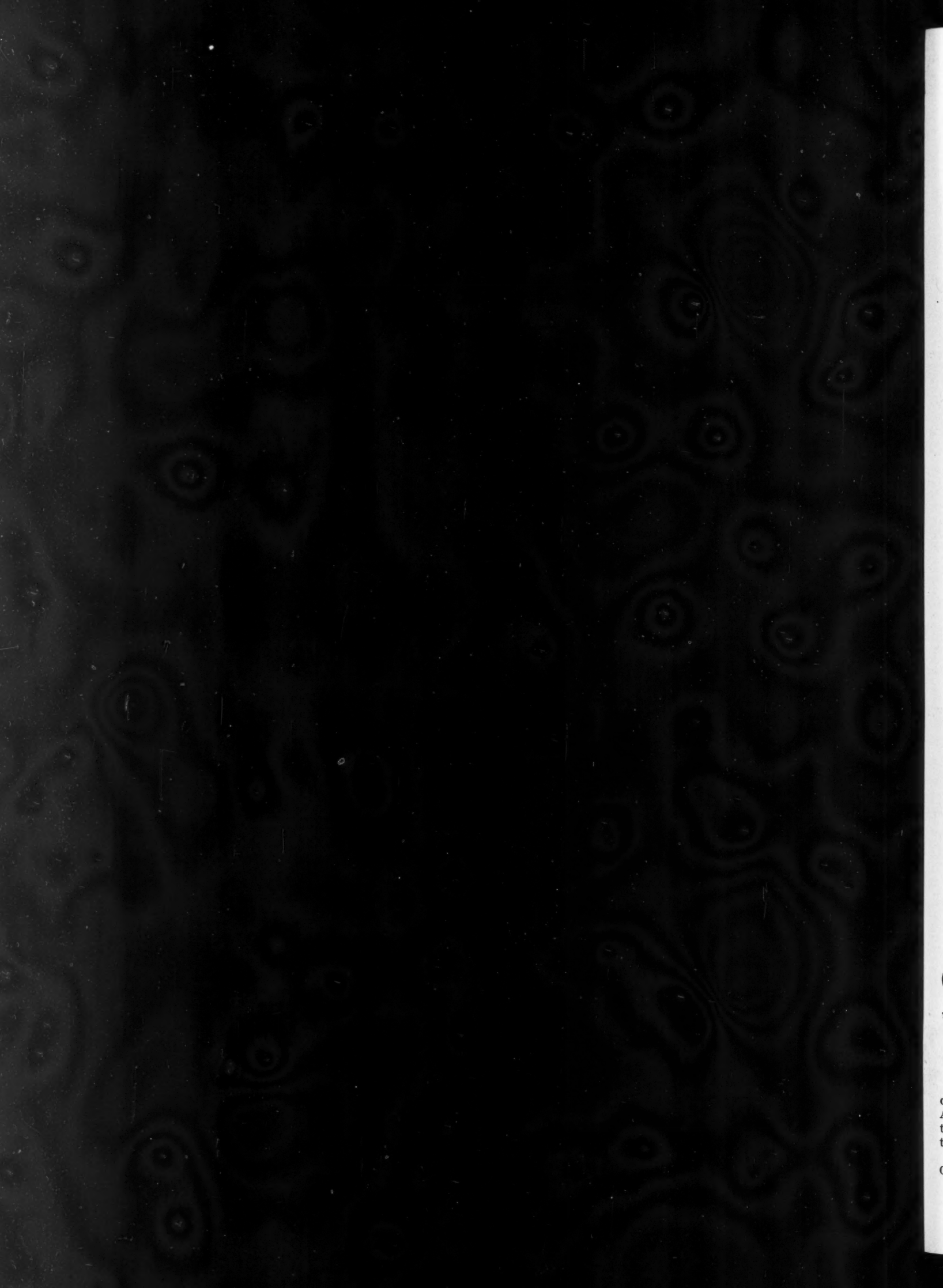
100 ft. long, 1½ in. diameter.....	\$ 11.00
Hangers	20.40
Motor, 10 hp.	335.00
Shaft.....	Included in lathe price
Running-in machine with fittings.....	490.00
14-in.	85.00
in. swing over carriage.....	818.00
.....	33.00
.....	70.00
.....	27.00
.....	90.00
.....	15.00
Motor outfit	247.00
.....	36.00
.....	50.00
.....	49.00
rack, 100 ft. with brackets	48.00
Carrier and hoist	34.00
.....	3.75
rod jig	30.00
.....	10.00
Straightener	34.00
press	35.00
.....	40.00
.....	76.50
.....	\$2,687.65

Pulley Dimensions

A—Line shaft	1½ in.
A-1	32 in.
A-2	20 in.
A-3	7 in.
A-4	10 in.
A-5	14 in.
A-6	20 in.
Electric motor	8 in.
Grinder pulley	4 in.

The Motor

The 10-hp. electric motor shown in the layout is designed to run at 1800 r.p.m. This will give the line shafting a speed of 400 r.p.m. With a 20-in. pulley on the shaft to drive the grinder, the latter will run at 2000 r.p.m., which is about 4000 ft. per minute surface speed for an emery wheel 7 in. in diameter.



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generally, because they have tilting features, clamping arrangements, etc., to speed up the work. The engine stands usually are portable and thus can be rolled directly to the cars when there is no overhead track and carrier. The axle stands are fastened to the floor and become a permanent feature of the shop.

Grinder Valuable

The grinder is one of the most valuable machine tools. Not only is it used for putting working edges on tools, but it comes in handy for dressing off forgings and castings by the use of rotary rasps, steel circular brushes and cloth buffing wheels. The steel brush is used to clean up rusty and rough metal parts.

If considerable grinding is to be done, a tool-post grinder for the lathe is a good investment, costing about \$60 for a machine with a wheel $\frac{3}{8}$ by 5 in. With a tool-post grinder, pieces that would ordinarily be machined on the inside can be ground.

The welding outfit is best mount-

ed on a small truck so it can be moved to any spot desired, but as a general thing it will probably be left near the welding bench. The latter has a revolving head, so the work can be brought to the correct position without having to lift it off the table.

The forge is a useful piece of machinery, but one of the things the dealer can go without, as long as he has the welding outfit and a good brazing torch. However, a shop that makes or repairs fender irons, body braces or does considerable frame work will certainly include a forge in its makeup. A 100 lb. anvil will take care of most of the work.

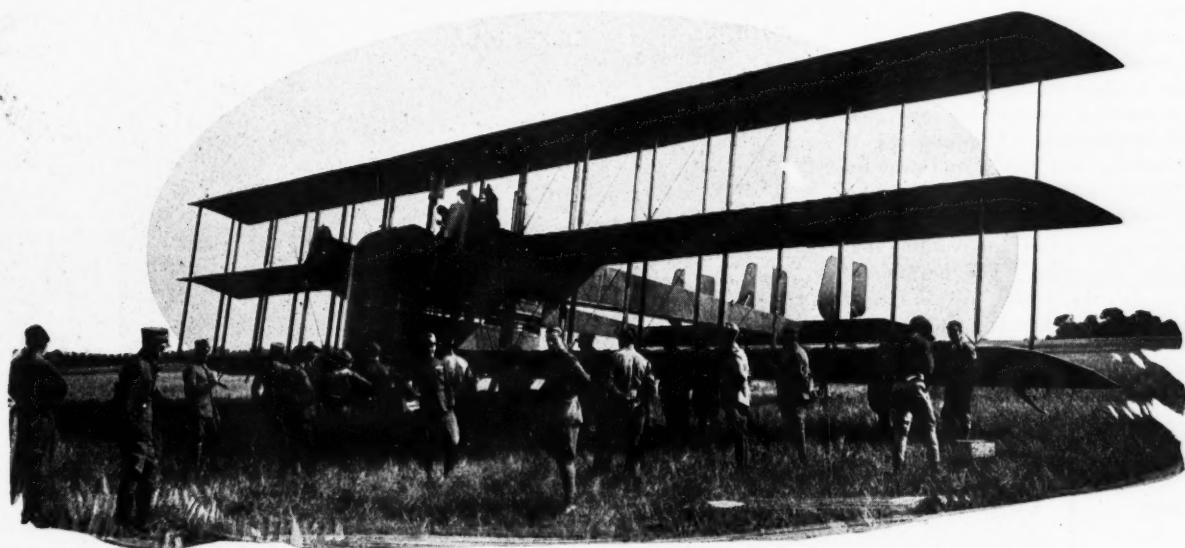
On the bench are shown five very important tools, the valve lathe, connecting rod jig, piston vise, crankshaft straightener—although this can be used for straightening work of any kind—and the small arbor press. The latter has a big brother in the shop, shown in the foreground. The big press will pry off

flywheels and do other heavy work, while the smaller press is handy for forcing bushings in and out.

In placing the machines and equipment thought has been given in regard to having the arrangement such that one machine is not in the way of the other. Thus, the lathe, for instance, has been placed so that long shafts can readily be handled without striking walls or other machines. The line shafting has been placed close to the rear wall of the building, which will eliminate to a great extent any danger of sagging of the rafters, and consequent slackening of the belts.

Small Tool Section

The classified small tool department has been selected to meet the needs of an establishment such as here described and can hardly be cut down to a much less elaborate list. The choosing of the smaller tools and other equipment is a subject for considerable thought and will be taken up next week.



Caproni Triplane Which Flew from Milan to Amsterdam

PARIS, Sept. 4—Paris received the visit recently of the twenty-passenger Caproni triplane which traveled under its own power from Milan, Italy, to the exhibition at Amsterdam. The machine flew over the Alps in the neighborhood of Mont Blanc and landed at the old American Acceptance park at Orly, in the suburbs of Paris. From this point the machine flew to Amsterdam.

One of the distinctive features of the Caproni is that it is fitted with three

Liberty 400 hp. twelve-cylinder engines, two of these being tractors and the third a pusher type. The two front engines are set just below the central wings and to left and right of the passengers' cabin. The third engine is in the rear of the central fuselage and practically on the same level as the two forward engines. The entire powerplant is on the center line of the plane. The passengers' cabin, which has entrance from the front, is very comfortably fitted for fourteen per-

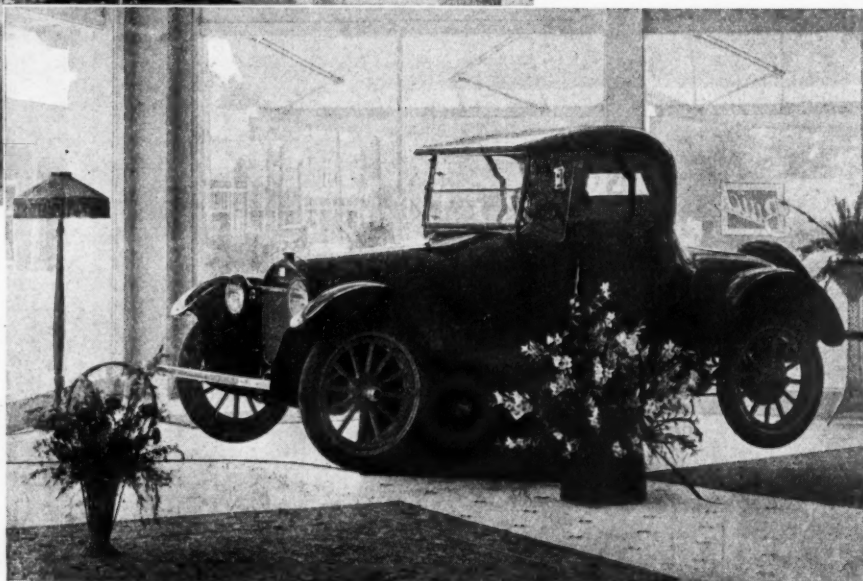
sons. Windows on each side and the full length of the cabin give a very complete view when in flight. Immediately above the main cabin is an upper deck where accommodation is found for six passengers, who are in the open air but protected by the scuttle dash.

It is understood the Caproni company has under construction at the present time a 100-passenger triplane equipped with five engines of 400 hp. each, giving a total of 2000 hp.

Art and Commerce in a Partnership



The Howard Auto Co., Los Angeles, Cal., distributor of Buick cars, believes in having its own branches. Several months ago a branch was established in Pasadena, and it proved so successful one was opened in Hollywood. The opening of the new building was made quite an occasion. Several hundred invitations were sent out. A roadster mounted on a rotating platform was an innovation that proved quite attractive. The permanent decorations on the walls are enlarged photographs of Buick cars in unusual scenic locations.



That a utilitarian object also may be a work of art is evident in this photograph of a Standard Oil gasoline filling station in Louisville, Ky. Just as our garages are becoming more sightly and handsome, so our filling stations are made beautiful

Selling Your Service

By K. Herrick

IN the mechanical inspection report the blank for the customer's order number is filled in only in case a written order with a number is the authority for the work and the date and time received are noted carefully.

The estimated date of delivery is filled in by the service salesman after consideration of the parts to be used and the length of time required to obtain them, if not in stock; the amount of shop work and any uncertainty as to delivery conditions.

Checking Operations

Motor is No. 2 operation and the subdivisions of "motor," therefore, all start with the number 2. The next number following shows the part of the motor that the operation covers, for instance, 21 under "Motor" is valves and timing gears, and the next number shows the divisions of valves and timing gears that the operation covers, for example, 213 means "renew one motor valve spring." This method is carried out through the entire eight principal divisions of the car.

Common sense and good judgment are vitally important to a service salesman in not going too far and reporting repairs unnecessarily.

When the inspector receives the mechanical inspection report he checks it over carefully to make sure he understands the service salesman's instructions and then proceeds to fill out the remainder of the form.

The entries at the head of the mechanical inspection report, headed "Gasoline Pressure," "Oil Pressure" and "Ammeter Charge" are filled in first as a matter of record, because they have an important bearing on the operation and condition of the car.

Standardized Operations

Standardized operations are the unit of work the service department has to sell in the repairshop. The repairs possible on Packard cars have been divided by the company into eight sections, each with its own subdivisions, all being listed on the mechanical inspection report and each having a separate operation number, which keys it and makes unnecessary the writing out in full of any type of repair.

There are some 700 operations and approximately 100 combinations of operations.

The operation numbers that are most frequently used being printed on the mechanical inspection report form, a check is placed before each item designating an operation to be made on the customer's car. The car carefully is gone over by the inspector and each item requiring an operation, whether mentioned in the instructions or not, is checked by the inspector. This report then is returned to the service salesman, who immediately lists the operations requiring attention and from his flat price book,

This is the second of a series by Mr. Herrick describing the successful service salesmanship methods employed by the Packard Motor Car Co. of Philadelphia. The third installment will appear in next week's issue of Motor Age.



Cliff G. Culver, general service manager of the Packard Motor Car Co. of Philadelphia

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about which more will be said later, figures out the price of each of the different operations. The service salesman then gets in touch with the owner of the car and explains to him the repairs required on it as shown by the inspector. The service salesman at this time is able to tell the customer exactly what each job will cost him. If the order is received, the order is billed at this figure, allowing no chance for complaint as to final bill for repairs.

The Operation Card

If the order is received, the order taker writes up the customer's order on the repair order form, showing the operation number of each one of the different repairs necessary and the price of each one of these operations. The time for each operation and the material used on each operation are listed on the operation card, or flat rate card, which, as in the case of the repair order and the mechanical inspection report, has the operation number at the top, on the right side.

This operation card shows how the flat rate quoted for any operation is arrived at and informs the office whether a job costs too much. The flat prices are combined in a flat price book on a buff flat rate sheet for trucks and a similar white sheet for cars, both sheets being in loose-leaf form. Each sheet shows one operation and the price of doing it on the various models of coaches or trucks. These sheets are combined in the flat price book in operation number sequence. The flat rate book is indexed, the indexing being divided into the eight principal divisions of the car as shown on the mechanical inspection report and again subdivided into the principal parts of each one of those divisions, so the particular operation number wanted is easy to find in the book.

Analysis of Repair Operations

On another white card form, printed vertically and known as the analysis of repair operations, is shown such analysis on all jobs as have gone through the shop, that is, every order on which work has been done in the shop is analyzed after it has been completed and the exact amount of material and the exact number of hours consumed in the operation are listed on this card.

When a sufficient number of these jobs has been entered on the cards, an av-

MODELS		OPERATION				OPERATION NO.	
REMARKS:							
FORM 252 8-19 3M PAGES OF 100							
BASIS OF CURRENT PRICE							
DATE						CHECKED	
MATERIAL							
SHOP LABOR	HRS. @		HRS. @		HRS. @		
TEST	" @		" @		" @		
SUPERVISION	" @		" @		" @		
TOTAL							
FLAT PRICE							
PIECE NO.	QUANTITY	MATERIAL			TOTAL LIST PRICE	TOTAL LIST PRICE	TOTAL LIST PRICE

Analysis of repair operations, also known as experience card

terial, with spaces for quantity, piece number, cost price and list price, represents the particular material, of course, used on that job. A maximum is established, but not a minimum. No more material then will be O. K'd by the cost department. A separate file is kept for these sheets, and there are five sets for four departments, as the cost department keeps two sets.

Operators' time must be within the time as allotted on the form.

After the five sets have been written up, enough flat rate sheets are prepared so every salesman has a copy.

The only form in the group of forms used by the cost department that is handled more than once is the working sheet. It is made up first and then handled again to transfer its data to the flat rate card.

When a work sheet has been filled out and is ready to file, before it is put away in the cost department drawer receptacle, all old sheets inclosed in their envelope in that particular space are removed, so the file never becomes choked with dead wood.

Another careful method in the cost department, in this connection, is to see each flat rate book has the proper sheets,

of which all service salesmen's sheets are duplicates.

Requisitions on Stock

When a requisition is used in connection with a repair order, it is made out by a shop office clerk at the request of a foreman or workman. The form is made out in triplicate, and each bears a continuous serial number, that is, there is no such thing as a second copy of a requisition. The quantity wanted, piece number and name must be given at the time it is made out, but the cost and selling price are not noted at this time. The original usually is receipted for by a stock runner, of which there are three or four on each of the shop floors. The requisition then is taken to the stock department and is the stock clerk's receipt for the supply wanted. The duplicate is retained by the cost department until the return of the original, when it is filed, and the triplicate is held by the material clerk in the shop as his receipt, showing the foreman or mechanic on the job used the material.

If the desired material or part is not on hand, the stock runner or workman is so advised and he in turn must notify the shop office clerk and foreman.

If a road test is made of a car brought in by a customer, the service salesman may accompany the inspector or discuss the car with the customer, with whom it is a good time to become better acquainted and to learn whether repairs other than those mentioned at the outset would be considered, whether accessories could be sold to him, if the welcoming floorman had not already found that out, and whether any of his friends are in the market for cars, favorable information being at once forwarded to the sales department.

When the mechanical inspection report covering the recommended work, in accordance with the instructions, has been completed, it is submitted to the service salesman, and on receipt of the customer's verbal authority, after the flat rate has been told to him, the detailed order is written up in the sales service correspondence office file and the customer signs the order for the flat rate, receiving a copy of it.

If a general overhaul is required and the customer cannot wait for details and a flat rate on them, a report is written up as accurately as possible from the customer's instructions and he is inter-

Form 14 2M 4-19 Pkgs. 100

Model	Owner
Type	Motor No. E. O. No.
Checked in by	Out by
Date	Time
Date	Time

Headlights (2)	Aux. Lights (2)	Bonnet and Handles
Headlight Bulbs or Tubing	Headlight Props and Rod	Bonnet Catchers and Straps
Dash Lamps (2)	Dash Lamp Bulbs and Tubing	Bonnet-Cover
Search Light	Search Light Bulb	Radiator Cover
Mirrorscope	Tool Box	Radiator Motometer
Tool Box Lock	Presto-Tank and Piping	Running Boards and Mud Guards
Floor Boards—Front Set	Coil Box and Units	Touring Trunks
Gauge Glasses, Shield and Bulb	Windshield	Battery Box
Windshield Rods	Special Horn—Electric	Battery Box Lock
Horn, Screen, Tube and Bulb Blow	Clock Bulb and Shield	Starting Battery
Speedometer Head—Make	Speedometer Bulb and Shield	Ignition Battery
Speedometer—Total Mileage	Speedometer Shaft, Gears and Bracket	Dry Cells
Crank Case Oil Can	Magneto Cover	Reserve Oil Can
Crank Handle Strap and Socket	Crank Shaft End Cap	Tire Holders and Straps
Front Bumper	Fenders, Front (2)	Baggage Rack
Hub Caps, Front (2)	Steering Connecting Rod Covers (2)	Baggage Rack Straps
Steering Cross Rod Covers (2)	License Plate, Front—No.	Hub Caps, Rear (2)
License Bracket, Front	Rubber Bumpers (2) and Straps (4)	License Plate, Rear—No.
Shock Absorbers, Front (2)	Shock Absorbers, Front (2)	State
Make	Make	License Bracket, Rear
Make	Make	Shock Absorber, Rear (2)—Make
Make	Make	Gasoline Tank
Make	Make	Fenders, Rear (2)
Make	Make	Dress Guards (2)
Make	Make	Tail Lamp
Make	Make	Tail Lamp Bulb and Tubing
Make	Make	Tail Lamp Prop
Make	Make	License Light, Bulb and Tubing
Make	Make	Wheels—Condition
Make	Make	Wire
Make	Make	Extra Shoes
Make	Make	Condition
Make	Make	Size
Make	Make	Extra Rims
Make	Make	Extra Tire Covers
Make	Make	Extra Inner Tubes
Make	Make	Tire Drum
Make	Make	Tires on Wheels—Condition—Front
Make	Make	Rear
Make	Make	Size—Front
Make	Make	Size—Rear

TOOLS

Open End W	Monkey	Spanner	Spark Plug	Hub Cap	Carb. Socket	Magneto	Socket	Body Lock Key	Presto Tank Key	Squirt Gun	Screw Drivers	Pliers	Hammer	Jack	Jack Handle	Tire Tools	Tire Repair Kit	Tire Pump	Rim Wrench	Wheel Puller	Large Grease Cup	Can Grease	Trouble Lamp	Spark Plugs	Tire Hose and Gauge	Tire Chains	Extra Bulbs & Fuses in case	Hydrometer	Crank Handle	Keys	Nos.
Condition of Paint on Body	Body Damaged	Top—Condition	Top—Folded	Top Envelope	Top Curtains (10)	Top Curtain Lights	Door Curtain Rods	Top Division Curtain	Top Valance	Top Bow Holders	Door Handles—All	Door Hooks—All	Door Levers—All	Cushions—Front	Rear	Remarks															
Received car and contents complete and satisfactory.	(Date)	(Signature—Owner or Chauffeur.)	191.																												

Customer's equipment check. A clerk in the garage checks off each unit of customer's equipment on this card and then deposits the equipment in a numbered bin in garage office

Form No. 254 MM 12-18 Page of 100		FLAT PRICES		OPERATION NUMBER	
		Motor Truck Division		DATE EFFECTIVE	
		<i>Packard</i> MOTOR CAR COMPANY OF PHILADELPHIA			
Description					
	MODEL	PRICE	MODEL	PRICE	
	TC		1 D		
	TD		1½ D		
	ATD		2 D		
	3 A		3 D		
	4 A		4 D		
	ATN		1 E		
	2 B		1½ E		
	5 A		2 E		
	6 A		3 E		
			4 E		
			5 E		

Form No. 254A MM 12-18 Page of 100		FLAT PRICES		OPERATION NUMBER	
		Motor Carriage Division		DATE EFFECTIVE	
		<i>Packard</i> MOTOR CAR COMPANY OF PHILADELPHIA			
Description					
	MODEL	PRICE	MODEL	PRICE	
	18		1-25		
	30		1-35		
	1-48		2-25		
	2-48		2-35		
	3-48		3-25		
	4-48		3-35		
	5-48				
	1-38				
	2-38				
	3-38				

A white sheet is used for the flat rate card of the motor car division and a buff card for the truck section. The entries on each are shown here

viewed later or advised by letter of the additional work to be done and new authority from him is obtained in writing.

Checking Owner's Equipment

When a car has been accepted for repair and before it is sent to the shop from the rear of the service sales department, a clerk fills out and checks off on a special equipment check, a manila form, the various units of the equipment on the customer's car.

This enumerates all that comes on the car, including tools. The customer may have a duplicate of the checked card if he desires, but this rarely is asked. As soon as the equipment is checked it is removed from the car and placed in a numbered bin, behind the caged office counter of the garage. When the customer's car has been repaired, and he sends or calls for it, he signs the equipment check under the legend "Received car and contents complete and satisfactory."

Check In and Check Out

Another and larger manila form is the record of cars, also known as the check in and check out card. As the owner's car is brought into the garage this form is filled out at the garage door and is turned in to the office at the end of every day. On it must be recorded the owner's name, driver's name, time it came in, license number and there may be added any remarks deemed necessary. When the car is taken out the space under the heading "Time Out" is filled in with the hour it left.

When the customer's car has been checked at the door as having entered and has been accepted for repair and all equipment checked off and deposited in the numbered bin, the mechanical inspection report, with its units of repair checked off, is placed in a pantasote case, or envelope, having a transparent face, and hung on the car.

Then a small white tag, reading "This Car Has Been Checked" and bearing the name of the checker, the repair order number and the name of the car owner, is attached to the front of the car as its passport to the shop. The car cannot be sent upstairs to the shop without it.

As soon as this tag has been attached a car mover is assigned to the job of seeing that the vehicle is placed safely on the big elevator leading to the shop—the seventh floor in the case of a car and the eighth in the case of a truck. The same mover handles this car when it returns.

Route Clerk's Duties

Of great assistance to the service salesman is a route clerk, whose duty it is to keep him supplied with all necessary information concerning the progress on the car. This clerk follows up the job closely from the time the car enters the repairshop, working in conjunction with the employees in the mechanical and coach departments. This clerk relieves the service salesman of much detail, permitting him to concentrate on selling

service instead of making a bookkeeper out of himself.

The route clerk, having obtained the first information about a customer's car from the order taker, makes the proper entries on two sets of cards fitting a tickler kept on the clerk's desk. Cards relating to cars that have been finished are kept in the back part of the tickler file, with the cards relating to cars still in work, in the front. Record of tests, painting and coach work also are entered on the cards in addition to the mechanical work being done. Every morning fresh information on each car in work is obtained and recorded, and the promises for delivery are entered on the reverse side. Whenever a customer desires information about his car, the service salesman thus is able to give every detail, including promise for delivery date, from the route clerk.

Repair Order Register

The repair order register sheet is a white form so filled out as to furnish the information at all times where a repair order is. There is a series for customers' cars and trucks, company cars and service cars.

Repair order numbers are registered on this sheet with a numbering machine, all other entries being made in ink. There are checking spaces for filling in when all orders have been received and, when all orders have been registered, billed in the billing column. C. O. D. orders are designated by the entry "C. O. D." in the

Alma, Mich., Sept. 26—The Northern Wheel Co. has let the contract for the first unit of its \$1,000,000 factory, and work will start immediately. The plant is expected to be in operation Dec. 1. It will be constructed of brick and concrete and will be 80 by 304 ft. The officers of the new company are: President, A. D. Smith; vice-president, J. W. Blakley; secretary, Orville Allen; treasurer, E. L. Smith.



EDITORIAL



What Strikes May Mean to You

FEW of us need to be told that the steel strike may seriously curtail the number of new cars on which delivery has been expected. Most dealers realize also that a long-drawn-out tie-up of the steel plants may mean a shortage in repair parts for some time to come. If complete closure of the steel industry is effected, the stocks of new cars and parts for spring business which normally should be accumulated during the winter may be lower next spring than they were last season—if such a thing is possible.

BUT the steel strike is only an indication of more widespread labor unrest which threatens to disorganize other industries that are just as important to the automotive trade. If, as seems not at all unlikely, the coal miners decide to strike to enforce their demands for a thirty-hour week, where will the coal come from to fire the engines

that pull the trains that bring your cars from the factories?

IF the coal operators compromise and increase their forces to make up for the shorter hours and grant the higher pay, the railroads will have to pay \$300,000,000 more a year for the coal they use. This will increase the already high freight rate on vehicles and their parts. If the agitation for nationalization of the railroads according to the Plumb plan results in a walkout of the rail men, driveaways will not help much—because there will not be much to drive away.

THIS labor unrest is spreading into all industries. Might it not creep into your service and repairshops? What are you doing to prevent it?

Car Thievery a Dealer's Problem

MORE than most of them realize, perhaps, the motor car theft problem is the dealer's problem. It is his problem even more than it is the owner's problem and far more than the manufacturer's. For very car theft is a direct blow at the dealer's business; it is a blow at his means of making a livelihood. If the motor car dealer's business is to continue a prosperous one, the motor car thief must be driven out of business, or at least his profession must be made as dangerous for him as any other form of crime.

EVERY car stolen means an owner who is not getting the service to which he entitled himself when he purchased the car. He either has lost his car outright or he has lost the use of that car for an indeterminate period. The dealer may not think it is his fault that this is so, but unless he makes a real effort to eliminate the conditions which make

motor car stealing easy, he is to blame. And a dissatisfied owner, whether he is your customer or someone else's, is bad for the motor car business—bad for your business.

AND every stolen car sold in your territory is a sale taken away from you. Have you ever considered that? Have you ever considered that persons who buy stolen cars should be buying cars from you instead?

CONCERTED, organized work should be done by the dealers to see that motor car theft is wiped out. You can eliminate most of the evil if you will take the issue up with your legislature and with your manufacturer, for these two bodies working together with you as the liaison can stamp out the theft evil.

Equipping the Repair Shop

LIKE the assembly and job-routing methods of our larger motor car factories, the well-conducted and equipped service station repairshop has its job routing directed along pretty well defined lines, made possible by the correct selection and disposition of the necessary machinery equipment.

BUYING the right kind of tools and machinery and adapting it to the peculiar requirements of a shop for proper co-ordination and inter-relation of the units, minimum interference, rock-bottom installation expense, with the faculties to tackle every job that comes in, are the chief thoughts and problems to consider in fitting out a motor car repairshop for the dealer or service man in the average town of average requirements.

BUYING the right kind of equipment means the dealer must analyze his territory, if already established, or if he is just getting started, the potential possibilities thereof. In other words, he must size up his present situation or his hopes for the future and then act accordingly in selecting and using his equipment. There are useful machines, to be sure, but if these are to be used but a few times a year, the investment is a poor one. Some shops are overloaded with machines; others are minus real labor-saving apparatus, or, have the wrong kind.

NATURALLY the room at the disposal of the dealer for his shop will be a dominating factor in buying and placing machinery, but where a new shop is being planned, the right installation easily can be had by logical procedure.

Branch for Rolls-Royce

Famous English Motor Car Company Will Build In the United States

\$7,000,000 American Capital Backs the Enterprise

NEW YORK, Sept. 30—An American branch of the British Rolls-Royce motor car company which will build the famous English car virtually in its entirety is to be established in the United States. Announcement was made last week that the branch here had been capitalized at \$7,000,000 and will be financed entirely by American capital through Aldred & Co., New York bankers. Under present war acts, British capital cannot be transferred to other companies for industrial purposes.

The American company will manufacture a chassis virtually identical with that made in England. The Rolls-Royce aero engine, parts of which were built in America during the war, also will be constructed at the new factory, the location for which has not been announced.

The financial plan, in itself partly incomplete as yet, was the only detail announced. It was said that the stock would be offered in about two weeks, despite fact that some of the organization plans had not been perfected. The name of the new corporation probably will be Rolls-Royce of America, Inc., and at least some of the company personnel would be English.

Plans Long in Maturing

Announcement of the plan preceded by a few hours the departure of Claude Johnson, directing manager of the English company, for Liverpool. Johnson, who spent several weeks in America earlier this summer, returned here last week and has been in daily conference with financial and manufacturing men.

Location of the proposed plant and the production plans could not be ascertained from the local branch of Rolls-Royce, Ltd. Maurice M. Olley, the company engineer here, said that it would not be determined for at least two weeks whether the American company would purchase or build a factory in this country. Several plants used in munitions making during the war have been under consideration and it has been intimated that the factory would be located somewhere in the New England states.

The announcement of the bankers was to the effect that the American company would "have all the advantages of the Rolls-Royce design and knowledge" and the chassis and engines made in this country would be of the "same standards" as those made in Great Britain. The announcement also set forth that the plant was made necessary by the American demand for Rolls-Royce cars which cannot be met from England, as the plants there have booked orders which will occupy them for more than a year.

The price of the chassis is set at \$10,000 and the company is said to have branches at New York, London, Paris, Madrid and Bombay.

DEALERS TO USE PROPAGANDA

St. Louis, Mo., Sept. 30—A campaign of general advertising is planned by the St. Louis Storage Battery Trade association to convince car owners that their storage batteries should be sent only to firms skilled in such work. The St. Louis association is composed of thirty-one of the largest battery firms in the city and the advertising is to be in the nature of propaganda work. It is noted in the advertising, however, that only firms skilled in this work are admitted to membership in the organization.

SHOW SPACE IS ALL TAKEN

Chicago, Sept. 30—All space for the annual exposition of the Automotive Equipment Association, which opens Nov. 3 in Medinah Temple, has been taken and the financial success of the venture has been assured. Applications for space are still being received by officials but cannot be filled. Space has been opened on the stage of the building to take care of some of the earlier of the late applicants but this also has been exhausted.

Work on the decoration of the hall soon will be started. The Congress hotel has been selected headquarters for the convention, which is to be a feature of the exposition.

NAME NEW WILLYS OFFICIALS

New York, Sept. 29—Announcement of the directorate of the new Willys Corp., made here last week, shows that J. N. Willys, the president, with his interests and holdings, has joined with the American Can Co. and Swift & Co. in the promotion of the new company. One representative of the packers and three officials of the can company are named on the board, in addition to Willys and to J. V. Hall, the general manager of the Duesenberg Motors Corp., one of the subsidiary companies of the new corporation.

The remaining directors are Edward F. Swift, president of Swift & Co., and F. S. Wheeler, president, J. R. Harbeck, vice-president, and Charles Stellberg, chairman of the manufacturing committee and director of the American Can Co. Harbeck is named vice-president and general manager of the Willys company.

SHEPARD NOT TIRE FIRM HEAD

New York, Sept. 30—The recent notice from East Orange, N. J., telling of the death of F. M. Shepard stated incorrectly that he was president of the Goodyear Tire & Rubber Co., of Akron, O. Mr. Shepard was president of the Goodyear Rubber Co., of 787 Broadway, this city, a concern manufacturing rubber products, and is not connected with the Akron corporation.

Protest Truck Show Site

New York Dealers Want Exhibit Located Nearer Passenger Car Building

Will Meet N. A. C. C. Officials For Change This Week

NEW YORK, September 28—Motor truck dealers of New York city are much opposed to selection of the Eighth Coast Artillery Armory for the motor truck show to be held January 3 to 10, at the same time as the passenger car show in the Grand Central Palace. The New York dealers desire to get as much actual business as possible out of the show and do not believe that the show visitors can be drawn that far up town. The Lexington avenue subway runs by Grand Central Palace and there are stations at the Palace and at the Armory, but it takes from thirty to forty minutes to ride from the passenger car to the truck show.

Truck Dealers Hold Meeting

In order to secure a little light on the situation, a meeting of the truck dealers called by the Motor Truck club was held at the Automobile Club of America last night and Alfred Reeves, general manager of the N. A. C. C. discussed the question with the dealers. They were unanimous in the opinion that it would be better to hold truck show in Madison Square Garden or in the 23rd Regiment Armory where the dealers held it last winter than to hold it so far up town.

There is nearly twice as much space in the uptown armory as would be available in the downtown location, but the dealers said they would rather have less space and a greater possibility of drawing people to the exhibit. Some comment was made as to the desirability of the shows being held by the dealers as they were last winter, but Reeves stated there was a demand for the shows being held by the N.A.C.C. and that he considered it best that this be done.

Hold Meeting This Week

Finally it was decided that it would be best for a committee representing the truck dealers to get together with the truck show committee of the N.A.C.C. and discuss the possibility of holding the show downtown rather than uptown. Reeves stated that while a contract had been signed for the uptown armory, he believed it would be possible to dispense with this location if it were found desirable. A meeting of the committee of the dealers and the N.A.C.C. will be held this week. The committee representing the dealers consists of A. C. Bergman, Standard Parts Co.; Harry R. Stokes, Packard Truck; O. E. Stowell, G. M. C. Truck; E. C. Hermann, Stewart Truck, and N. H. Moore, chairman of the Motor Truck Association of America.

Ottawa Dealers Organize for Shows

Plan To Hold Second Canadian National Exposition This Year

OTTAWA, ONTARIO, Sept. 27—Formation of a motor trade association in Ottawa to handle a proposed motor show some time in February is being planned. The tremendous success of the motor car exhibit of the Central Canada Exposition just closed was the cause leading to the formation of the body. The Ottawa trade is now more than ever inclined to undertake an exclusively motor show.

One thing which has emphasized the importance of the show of the Exhibition was the appearance of a considerable number of factory officials at the exhibits. Representatives of the Dodge, Overland, Oldsmobile, Chevrolet, Dort, McLaughlin, Briscoe, Maxwell, Ford and other companies were on the scene.

Will Be Held in February

The best dates for the proposed Ottawa motor show would be from Feb. 21-28. The reason for the suggestion of this period is that it would immediately follow the Montreal motor show, which is held on the heels of the national shows, in New York Jan. 3-10 and in Chicago Jan. 24-31. The Montreal exhibition will take place in February, so special exhibits can be shipped from Chicago to Montreal. The Ottawa display probably will be held immediately afterward so these displays could be shipped direct from Montreal to Ottawa and thence to some other city. Detroit probably will have an exposition in the early spring and, in fact, all important cities in Canada and the United States will be having their motor displays again next winter.

To Use Government Building

The use of a government building has been suggested for the Ottawa motor show, and this may be secured if the local dealers go after it in good time.

The motor car show of the Central Canada Exhibition was the most successful ever held by the trade of the capital, according to statements by various dealers at the exhibition. More than 300,000 paid admissions were registered.

The consensus was the exhibition has been the most successful from a business standpoint ever supported by local retailers. Considerable orders for new cars were booked during the week. Many sales were made right on the grounds, one dealer reporting that he had sold three cars from his exhibit on the first day of the show. The names of many prospects also have been secured by the exhibitors.

TRI-STATE SHOW IS SUCCESS

Memphis, Tenn., Sept. 30—Large crowds attended the motor car exhibits of the Tri-State fair here last week. Many notable people, including the governors of several of the southern states

are here. The bulletin news service early Friday that President Wilson had canceled his engagement in Memphis was a source of disappointment to many who hoped to see and hear him here Saturday night.

Both automobiles, trucks and tractors share attention at the fair. If more space had been available twice as many cars would have been shown, but the exhibit was immense and the arrangement attractive.

MONTREAL TO RESUME ITS SHOW

Montreal, Que., Sept. 30—Announcement is made that the annual Montreal motor show will again be held under the

DES MOINES, IOWA, Sept. 30—A novel method of advertising itself and its business has been adopted by the Dunlap Motor Co., distributor of the Fordson tractor.

A contest has been arranged for Sept. 5-Nov. 8 between farmers of Boone and Story counties with prizes of 25 gal. of tractor cylinder oil for the best ten ears of corn grown; 15 gal. for the second best ten and 10 gal. for the third best. Agricultural experts from Iowa State College will act as judges.

To call further attention of the farmers to their business, in the advertising of the contest, all reference to the prizes calls attention to the fact that "this is the grade used in the Fordson tractor."

auspices of the Montreal Automobile Trade association, Ltd., early next year. There was no show this year on account of the war. The active secretary of the association, Adelstan Levesque, states that virtually all the Canadian and American automobile manufacturers will be represented, as they have already inquired about exhibiting space and that inquiries had also been received from European firms anxious to secure space. The date and location of the show will be announced later.

BRISTOL PLANE COMES TO AMERICA

New York, Sept. 27—The British and Colonial Aeroplane Co., Ltd., has opened offices here and will introduce the Bristol airplane into America. W. G. Rannels is in charge as business director of the American interests. The company, which has British army contracts until next March and which also has a considerable commercial production, plans to establish a system of distribu-

tion here similar to that operated by the motor car industry. It will operate through distributors, with district managers and salesmen, in much the same way that automotive companies handle their product.

Mr. C. Rannels states that the method of development will be conservative and that the company desires to build on a firm foundation.

NEW TRACTOR FIRM IS STARTED

St. Louis, Mo., Sept. 30—The Kardell Tractor & Truck Co., a \$1,000,000 Delaware corporation, has begun the manufacture of farm tractors in St. Louis, occupying the plant formerly owned by the Whitman Agricultural Co., which has 175,000 ft. of floor space.

All parts are made in the plant except the engine and wheels. The engine is being manufactured by the Wisconsin Motor Co. of Milwaukee, and the wheels are of French and Hecht make.

H. W. Kardell is president; J. C. Cardell, vice-president; W. F. Fahey, treasurer; H. F. Fahrenkrog, secretary.

KENTUCKY HAS TRUCK LINE

Louisville, Ky., Sept. 27.—The Union Transportation Line, with a capital stock of \$100,000, was organized last week by several Louisville business men interested in providing reliable and convenient means of freight transportation from Louisville to Kentucky and Indiana points within a radius of 100 miles. H. A. Kampmueller, general manager of the new concern, states that the company plans to erect a modern two-story truck line depot and several downtown sites are now under consideration.

The new line has made an exhaustive study of the roadway conditions within the 100-mile radius of Louisville, taking in Lexington, Elizabethtown, Hodgenville, Lebanon, Harrodsburg, Lancaster, Nicholasville, Georgetown, Shelbyville, New Castle and all intermediate points in Kentucky and Corydon, Paoli, Bedford, Seymour and Madison, in Indiana. The company plans at this time to establish truck lines to cover this territory as rapidly as they can be put into operation.

The company's freight depot will centralize the company's business and operation and will contain many features worked out and now practiced by several successful truck lines. The depot will contain a restroom for women, provided with lockers.

There also will be a business room for men at which daily market reports will be on file, with telephone and other facilities. Garage space will be provided in the building for out-of-town customers and every assistance given them in the sale of their products and the purchase of supplies. The plans for the depot provide for sufficient wareroom spaces for the sixty-one independent truck operators now running in and out of Louisville and Louisville shippers may deliver their merchandise at the station, where it will be allotted its proper space to catch the first truck to

its destination. No charge will be made the farmer for business room and rest-room privileges, and it is the intention to make the Union Line depot a meeting place for the men and women of the rural districts to transact their business in Louisville.

The line will afford the farmer a prompt and efficient means for the transportation of farm products to Louisville and the immediate delivery of merchandise from the city. Many important objects are to be accomplished by the operation of a successful truck line out of Louisville including national advantages considered from the standpoint of increased food production in this territory.

SKELTON GETS PREMIER CONTROL

Indianapolis, Ind., Sept. 27—Dr. L. S. Skelton, of Okmulgee, Okla., has become head of the Premier Motor Corp. through the purchase of 65 per cent of the stock. He will assume the general management of the concern. The department heads will be retained.

The plant is to be enlarged immediately, Dr. Skelton said. Production requiring 2000 employees is being considered. Quantity production on the new model Premier is to be started, about 200 having been practically completed. The new owner has extensive oil, glass, lead and zinc interests in the west. He was distributor for the Premier in Los Angeles and other places in the west.

Officials of the Premier Motor Corp. would not confirm the assertion made by Doctor Skelton that he had purchased controlling interest in the corporation. A deal is said to be still pending.

ST. LOUIS TO MAKE SKELTON

St. Louis, Mo., Sept. 28—A contract to manufacture 20,000 motor cars has been closed by the St. Louis Car Co. with the Skelton Motor Corp., recently organized by Dr. L. S. Skelton. Production will begin at once, the company being readily enabled to convert its facilities use for the manufacture of airplanes, steel freight cars, ammunition cars and automotive repairshops for the allied armies during the war to the manufacture of motor cars.

The new car will be of the light four-cylinder type. E. B. Meissner, president, said the company expected soon to be able to complete fifty or more machines a day. The regular force of workers is 1200, but this will be increased 800. It is announced the operation will be part manufacture and part assembly at first, with the ultimate aim to manufacture the entire car here.

W. A. Chapman, former field secretary of the Dort Motor Car Co., is general manager.

INTRODUCE COAST ROADS BILL

Washington, Sept. 30—A bill has been introduced in the House of Representatives authorizing the survey of roads in Washington, Oregon and California adapted to heavy truck transportation

Taxes Discussed by Manufacturers

Revenue Officials Ask Motor Men For Aid in Making Assessments

WASHINGTON, Sept. 26—The National Automobile Chamber of Commerce and the Motor & Accessory Manufacturers' association held a meeting here Tuesday with the Department of Internal Revenue to define and discuss recent tax measures. The department believes that it needs intimate knowledge of the operation of the industry before it can interpret clearly the terms of the tax or define the methods of collection.

The conference, which took no definite action of any sort, included discussions of the definition of "automobile trucks, automobile wagons and other automobiles" and definition of the term "parts and accessories." Discussion of the meaning of "further manufacture" as used in the internal revenue law took place, and the question was also brought

Jim is keeping his shop busy and his profits up all winter.

How does he do it?

Motor Age will tell you in the Winter Service Issue on November 6 how Jim is doing it and you can do it.

up whether it would be possible to inaugurate a system whereby parts could be taxed without the use of multiple certificates in the case of successive sales. The term "general use as a commercial commodity" also was discussed, as was the establishment of some method whereby jobbers and dealers could account for taxable articles purchased by them from the manufacturer and subsequently diverted to use on an article not taxable.

as a preliminary to the establishment and maintenance of a national system of truck defense and post roads along the Pacific Coast. In addition to being used as a national defense and post road system, the contemplated system is to be open to the use of the general public free of tolls and under state control except when used for national defense and military purposes. The bill would appropriate \$250,000 to defray expenses.

This bill is not believed to interfere with any of the legislation now pending in Congress for the establishment of a Federal Roads Commission. It is merely a bill which would authorize special military defense highways for the protection of the Pacific Coast which would be under the direct supervision of the War Department.

The industry also asked for simplification of the regulations applying to export sales. The export sale regulations now limit the time in which proof of exportation must be furnished and also demand considerable proof.

The definition of the terms "automobile, automobile wagons and other automobiles" was asked to clarify definitely the situation as regards tax on motor truck chassis. Definition of the words "parts and accessories" was taken up to determine whether or not commodities which are used on cars but are also used for other purposes are or are not taxable.

BURY HEADS PACKARD DISTRIBUTION

Chicago, Sept. 27—George R. Bury, formerly general manager of the Packard Motor Car Co. of Chicago has been recalled to Detroit by the Packard factory and will hereafter fill the position of general distribution manager there. Mr. Bury had been in Chicago only a few months, taking over the management when the Packard factory purchased the distribution business of the old Chicago Packard organization and converted it into a factory branch.

Charles G. Embleton, general distribution manager for the Chicago company, has succeeded Mr. Bury as general manager here. Mr. Embleton has been with the Packard Motor Car Co. for twelve years, starting in the assembly room, thence through the stages of demonstrator and salesman to branch manager. He has conducted branches at Springfield, Mass., Hartford and New London, Conn., Newark, N. J., and Brooklyn, N. Y., and was territorial manager for the Packard for New York.

BALTIMORE TRUCKS PARADE

Baltimore, Md., Sept. 28—More than 1400 trucks representing eighty-four distinct lines of business and industry, paraded through the streets of Baltimore in a pageant arranged by the motor car dealers' association. While it was primarily a motor parade, it was also a real display of business.

Many of the trucks were exceptionally well decorated. Several horses were carried on trucks and one mule also was in a pen. William Schluderberg & Sons, with a large fleet, carried hogs, cows and other animals. The parade while awakening the merchants of the city to the motor truck in a new way also provided an avenue of advertising for firms which went into it.

While many firms were expected to show accessories for motor cars and trucks, they were conspicuous by their absence.

Makers Must Aid Campaign Against Motor Car Thieves

CHICAGO, Sept. 29.—That manufacturers are not giving their dealers sufficient territorial protection in the matter of stolen cars is the assertion made by E. L. Rickards, manager of the Automobile Protective & Information Bureau. The bureau is maintained by a number of insurance companies engaged in writing motor car theft policies, and its work is confined to the running down and identification of stolen cars.

It is in the identification of stolen cars after they are recovered that the manufacturers are falling short of their duty to their dealers, according to the bureau. Dealers are losing scores of sales each week because stolen cars are sold in their territory at prices they are unable

as the transmission number, is long, tedious and sometimes impossible.

An example of this was given in a recent investigation in Iowa where fourteen cars, all of which were believed to have been stolen, were recovered. As usual, the serial engine numbers on all cars had been defaced or altered but on every car the investigators were able to find at least one of the original "secret" numbers. To identify these cars, a hunt had to be made through the entire files of the manufacturers and more than a month was consumed before all cars could be identified. Had a cross index system been used by the makers, this identification could have been established in half an hour.

In furtherance of its campaign for a proper manufacturer's record, the bureau has co-operated with a leading office equipment manufacturer, and a machine

shortly will be put on the market which will do the cross index work at no more expense than that of the present inadequate system. So far, however, manufacturers have shown little inclination to co-operate with the insurance companies and such co-operation can be forced only by the dealers and by the public.

A change in methods in vogue in state registrations also is being sought. While most of the states require the serial number of the car when application is made for license, the license is indexed only under the name of the owner and the name of the car. If it also were indexed under the serial number, duplications of these numbers caused by substitution by thieves readily could be detected.

CORPUS CHRISTI NEEDS HELP

St. Louis, Mo., Sept. 30—Financial assistance for Corpus Christi and its vicinity is requested of motor car dealers throughout the United States by the National Automobile Dealers' association.

Active support of the Dyer Bill now before the Senate, making motor car thefts a Federal offense, has been urged upon members of the National Automobile Dealers' association by Harry G. Moock, business manager. His appeal is as follows:

"Twenty-eight million dollars worth of motor cars were stolen in 21 large cities of the United States in 1918. The Dyer bill offers an effective curb to this thieving.

"Write or wire your United States Senator to vote for this bill. Ask your bankers and merchants to do likewise."

to compete with in legitimate sales. Many if not most of these sales can be prevented if the manufacturers can be brought to co-operate with insurance companies in identification of their products.

Stolen Cars Hurt Dealers

"Every stolen car sold means that the dealer in the territory in which it is sold has been deprived of his rights of exclusive sale under his agreement with the manufacturer," is the way the bureau sees the situation. "And every car that is stolen means that the business of selling cars has been given a setback. For the man whose car is stolen is disgusted and, as he must wait at least sixty days for payment even if his car is insured, he is likely to feel that owning a motor car is too expensive a luxury for him."

Manufacturers can fulfill their duty toward their dealers in the matter of identifying cars believed to be stolen by a simple change in their methods of keeping car records. At the present time, manufacturers, with one or two notable exceptions, have confined their records simply to keeping a file arranged as to serial engine numbers. Other numbers appear on these file cards, but they are not cross indexed and the task of finding any of the other numbers, such

Service Work Results in Sales of Many Tractors

KANSAS CITY, MO., Sept. 30—Service has been one of the big factors in the success of George T. O'Maley, who has sold more than 10,000 Fordson power farming outfits in Missouri in less than a year. The apex of service obligations on the O'Maley organization was reached in August. Dealers now have competent sales and service organizations of their own. They are increasing their shop equipment. The dealers are so distributed over the state that no owner will be further than 10 miles from a Fordson service station. Dealers whose territory has a greater radius than 10 miles or who are located in one corner of their territory, have one or more substations. These substations are usually garages, whose managers the dealers have trained in Fordson service and whom they keep supplied with parts.

Service Men Cover Territories

O'Maley service and division men cover their territories every six weeks. Upon reaching a town, a service man calls upon, or talks over the telephone with, every owner who has bought a Fordson outfit since his previous visit. He checks the owners as to the results they are getting with the outfits, what service has been sought, if any, and whether the service has been efficiently rendered. If necessary, the traveler visits the farmer and inspects the tractor, and makes suggestions on care and operation.

Formerly the traveling service man was allowed to render service himself; now, when service is needed, the traveler refers the owner to the local dealer. The traveler uses the data gathered from owners and in helping the local

dealer to get his service department on a sound basis.

O'Maley is developing a system of gathering direct from owners information on the farmer's idea of power farming after he has had his outfit thirty to sixty days. This data is to be recorded on a card index and will be used for many purposes, in both sales and service departments. The chief use will be in checking up the service rendered by the local dealer.

SHIP-BY-TRUCK FOR ST. LOUIS

St. Louis, Mo., Sept. 30—The St. Louis Chamber of Commerce has plans to make Oct. 25 a ship-by-truck day and is attempting to have Mayor Henry W. Kiel proclaim the day as such. A parade of commercial vehicles will be the feature of the celebration. James E. Coyl, manager of the transportation department of the chamber of commerce, is in charge of arrangements.

ATLANTA PLANS FOR BIG SHOW

Atlanta, Ga., Sept. 30—The Atlanta Automobile Show, which will be held in connection with the Southeastern Fair, October 11 to 21, inclusive, will be under the auspices of the Atlanta Automobile association. President R. H. Martin has issued a bulletin to all exhibitors giving the latest rules decided upon.

Motors cars, airplanes, trucks, tractors, farm light outfits and accessories will be exhibited, but the show will be independent of the other automotive exhibits and will be confined exclusively to passenger cars. Space has been allotted to more than twice as many exhibitors as last year, and every indica-

tion is that this will be the very best show possible in connection with a fair.

All decorations, signs, etc., will be handled by a central committee appointed by the association, composed of representatives of the leading firms.

Many dealers in the southeastern states will attend this show, and many of the Atlanta distributors have planned appropriate entertainment for their dealers who visit them during show week.

HOUSTON SHOW POSTPONED

Houston, Tex., Sept. 30—Houston's Tractor Demonstration, which was scheduled for Oct. 1 and 2 has been indefinitely postponed, according to announcement made this week. The postponement was necessitated because of a conflict with the Dallas Fair and by the fact that a heavy storm on Sept. 14 caused severe damages to surrounding farms, from which the demonstration was expected to draw much of its patronage.

Canadian Tractor Show Eliminates Competitions

OTTAWA, ONT., Stp. 27—The greatest farm tractor demonstration in all Canada this year will be seen at the annual ploughing match at the Canadian government's experimental farm and the adjacent J. R. Booth farm, Oct. 14-16, under the auspices of the Eastern Ontario & Western Quebec Ploughmen's Association.

The tractor demonstration will be conducted on a tract of 200 acres, and it is expected that more than thirty-five machines will be shown in operation. Preparations are being made to handle at least 20,000 visitors in the capital during the three-day event for which single rates for the round trip have been secured on all railways.

No Competitive Tests to Be Held

The tractor manufacturers will be given virtually a free hand in arranging for the individual tests for their demonstrators but no trophies will be awarded for the exhibitions. There is to be no charge for the privilege of demonstrating tractors on the field. W. H. Day, a farm specialist of Guelph, Ontario, and W. D. Jackson, district representative in Carleton County for the department of agriculture, have been appointed officials to have charge of tractor demonstrations.

Provision has been made for exhibits of tractors, other than demonstrators, as well as cars, accessories and power farm machinery, including farm lighting outfits. Manufacturers or agents will be permitted to erect tents or booths for the exhibits and there will be no charge for such displays, except where arrangements are made for the actual sale of articles on the grounds.

CHICAGO, Sept. 20—Dealers and supply houses in the larger cities who have less-than-carload lot or express shipments of repair parts or other merchandise can speed up their freight shipments and get practically express time at l.c.l. freight rates by taking advantage of the service offered by the forwarding companies. The Chicago Automobile Trade association has investigated the possibilities of utilizing the forwarding companies by grouping a number of small shipments from various shippers in one city to different members of the trade in Chicago.

As a result of its investigation, a report has been issued on the saving which may be obtained in Detroit-Chicago shipments, if Chicago dealers will co-operate in utilizing forwarding companies in the same way that they are used in the furniture and other trades. The C. A. T. A. finds that "second-

Arrangements have been made for the use of a siding of the Canadian Pacific railway for the unloading of tractor exhibits at the experimental farm and the Ottawa Electric railway also will provide a special service to the field. The farms are close to the city, however, and the demonstration will be easily accessible to local residents as well as visitors. Some of the tractors and farm machinery exhibits have already arrived and are being stored without charge in Howick pavilion, one of the local fair buildings.

The tractor displayed and demonstrated will be representative of the tractor industry in both Canada and the United States. More than twenty manufacturers are expected to have from one to three tractors on the ground for the event. The Ottawa match is the one event in Canada which is receiving general support of tractor manufacturers this year.

Money grants have been provided by the city of Ottawa and the county of Carleton to take care of various expenditures in connection with the demonstration.

NAPIER MAKES FAST FLIGHT

London, Eng., Sept. 30—Capt. Gathergood of the British air service, is believed to have made the best record in the exhibit flights to the Amsterdam Show this month. Capt. Gathergood flew a new Aircro 9-R machine from Hounslow to Soesterberg in 2 hr. 10 min., an average of 134.5 m.p.h. The machine flown by Capt. Gathergood was equipped with a 450 hp. Napier aero engine and had been in the air less than five minutes before the flight was undertaken.

Combination Shipments Save Dealers Expressage

morning delivery" may be had on motor car parts and accessories at from 54 to 64 cents per hundredweight, whereas express shipments with two to five days' delivery are \$1.54. Likewise, goods which now come as less-than-carload lots in one to two weeks can be had in two days at the same rate as before.

Dealers in New York, Boston and Philadelphia are now using this method of speeding shipments.

INDIANA HAS A "HIGHWAY DAY"

Indianapolis, Ind., Sept. 30—Indiana celebrated Highways Transport day this week and set the stage for big future development of the highways and the utility of the motor vehicle in Indiana. The feature of the day was a motor truck parade, staged by the Indianapolis motor truck dealers, Indiana transfer men, and owners of trucks who are interested in inter-city hauling or in the rural motor express work.

Aside from the public, the most interested spectators were delegates to the convention of Indiana bankers, and the convention of county commissioners. From different viewpoints the bankers and commissioners occupy a most important place in the development of the highways and motor truck hauling. Bankers and commissioners who saw the parade were convinced of great possibilities in the motor truck as a means to develop the resources of Indiana, and as a means of carrying more service to the consuming public.

LONDON-PARIS AIR LINE ESTABLISHED

Washington, Sept. 27—Arrangements have been made for weekly air service between London and Paris, machines to carry fourteen passengers at \$75 each, according to announcement made by trade commissioner Grady. The American agents for aircraft transportation and travel hope to arrange in the future for liners from America to be met regularly by airplanes at English and French ports so that business men may lose no time in their journeys to London.

NEW RENAULTS IN NEW YORK

New York, Sept. 27—What are said to be the first European post war cars to arrive in this country are some new Renault cars just received by the Renault's American branch here. They embody several new features, including silent, single-unit S.E.V. starting system attached to the crank shaft at the front of the engine, making the starting dynamo extremely accessible and monobloc-type engines in the 12-18 hp. and 18-30 hp. models. All have a three-point suspension on the main frame, instead of on a sub-frame as formerly. The new automatic carburetor with the flange is attached direct to the cylinder casting. Unusually high road clearance adapt these cars to American conditions.

Electrics Also Behind

Same Shortage As In Gasoline Field
In This Type of Trucks
and Cars

Vehicles Are Popular in Suburban
Towns

NEW YORK, Sept. 29—Increased output of electrical passenger cars is needed to meet present demands, the situation comparing somewhat to that of gas cars. This was revealed here today at the New York Electrical Show at the Grand Central Palace at which exhibitions are being made of vehicles propelled by electricity.

Factories making passenger cars are said to have turned from war work confronted with a large market which has not yet been supplied. One exhibitor here declared he expected to receive no further shipments until December and that he had only a few cars which had not yet been sold. The fall demand was expected to take these soon, it was said. Another exhibitor declared that the only cars available for New York sales were being exhibited at the show and that further shipments were not expected until November.

Suburban Towns Like Electrics

The sale of electrical cars in this district is said to be largely to nearby suburban cities in the states of New York, New Jersey and Connecticut. Few buyers were reported from New York city for passenger cars, the field here being larger for the sale of trucks. Trucks, however have been exported in some quantities to the northern countries of Europe, it was said, as gasoline prices are high in those districts whereas, due to water-power development, at some places the rates for such power were low. Dealers spoke of this field as offering gratifying markets, although the last few weeks had witnessed a seasonal falling off.

Few changes over the pre-war models were described, although minor changes, principally in body designs had been made. The Detroit has changed its spring suspension, reduced tire sizes, strengthened wheels and rearranged its wiring system. The Baker R & L changes have been confined to the body. Detroit, however, expected within a few days to make the first showing of a new model sedan, built to follow the conventional gas car lines. Both cars have made price increases since Jan. 1.

Trucks Are in Demand

Distribution of electric trucks in New York has been in excess of passenger cars, it was stated, particularly to department stores and other concerns having delivery systems requiring frequent stops. One company showed a completely fitted fire truck that will go into operation following the show as, one

of a fleet of electrical vehicles in a New Jersey city.

The show, which opened Sept. 24, will continue until Oct. 4.

AIR RACE ACROSS CONTINENT

New York, Sept. 30—Announcement of a transcontinental airplane endurance contest between New York and San Francisco which is to start Oct. 8 was made this week by Maj. Gen. Charles T. Mencher, director of the United States Air Service. Contestants may start either from New York or San Francisco and will follow the same course between the two cities.

The contest is open to all Government pilots and planes, but the planes must be standard in every detail, while the pilots must secure the recommendation of the commanding officers of their fields. A system of handicaps is to be

Government Material for Rebuilding

Washington, Sept. 27—The tractor plant of the Moline Plow Co., Moline, Ill., which was destroyed by fire recently soon will be re-established with machinery sold to the company by the War Department. The company has purchased milling machines, drilling machines, planers and grinders from the War Department through the department of sales of the Ordnance and Air Departments.

devised to put all on an equal footing. Three points are to be considered in determining the winner, elapsed time between start and finish, actual flying time and flying time based upon the handicaps allotted. No prizes are to be given.

The main purposes of the transcontinental contest are to determine the reliability and general fitness of the various types of machines, to demonstrate the feasibility of an aerial mail service between the two cities and to show the public the development of aircraft in the last few years.

Contestants may make their start either from Mineola, L. I., or from San Francisco. Controls have been established along the route at Binghamton, Rochester and Buffalo, N. Y., Cleveland and Bryan, Ohio, Chicago and Rock Island, Ill., St. Paul, Minn., North Platte, Neb., Salt Lake City and Salduro, Utah, Battle Mountain, and Reno, Nev., and Sacramento, Calif. Stops of not less than 30 min. nor more than 48 hr. must be made at each of these controls.

Vesper Raps Car Shortage

Misuse of Railroad Equipment Cause
of Most of Trouble,
He Says

Urges Hines to Stop Evil to Aid Motor
Dealers

ST. LOUIS, Sept. 30—An effort to relieve the freight car shortage which is handicapping motor car dealers is securing cars from their factories is being made by the National Automobile Dealers' association through President F. W. A. Vesper. Mr. Vesper has sent the following telegram to Walker D. Hines, director general of railroads:

"Reports to National Automobile Dealers' association indicate serious loss to dealers because manufacturers are unable to get freight cars. Great hardship is being occasioned to thousands of dealers whose expenses can only be met by delivering motor cars. Our association understands special motor car equipment is being used for every kind of loading and except for order operative in Chicago region cannot be returned to factory towns empty. As motor cars must be loaded in special equipment the dealer situation is extremely critical because that equipment is unavailable at a time when deliveries must be made to consumers. This situation needs your prompt and vigorous consideration so that equipment can be returned to factories for reloading. Suggest wide extension of Chicago regional order permitting return of empty motor car equipment from all parts of the country to manufacturing points."

GRANT TO DOUBLE ITS OUTPUT

Cleveland, Ohio, Sept. 30—Production of 20,000 Light Sixes, double its present output, has been announced for next year by the Grant Motor Car Corp. The Light Six is an entirely new car with 118 in. wheelbase, 2 in. longer than previous models, and a larger engine of the same general characteristics as the present model, having a bore of 3½ in. and a stroke of 4½ in., the bore being ⅛ in. greater than the present engine. The exterior of the car has been changed completely by the adoption of a new radiator design and a bevel edge type of body which makes a low car of smart appearance. Open models will sell for \$1,495 and closed cars for \$2,450.

ATLANTA SUFFERS FROM BIG FIRE

Atlanta, Ga., Sept. 28—Atlanta's motor row suffered a \$200,000.00 fire this week when the establishments of the Patterson Auto Co., distributors for Patterson cars in the southeast, the Bohler Auto Service, the Standard Tire & Rubber Co., and the Pyrene Manufacturing Co. were destroyed. The new firm of Alexander & Gunn, accessory dealers, suffered 50 per cent loss from fire and water.

Service Profits Depend On:

STOCKROOM

Layout, Bin Location and Arrangement for Various Types of Parts

By Harlan C. Skinner

Motor Age Editorial Staff

TO lay out a stockroom properly is simply a problem of economic utilization of space and proper location of bins to prevent unnecessary waste of energy. It was found in considering the fundamentals of the garage design that the center aisle principle made possible the best utilization of space and enabled one to get the most cars into a certain floor area. This fundamental also applies to the stockroom, as it should be arranged so a hand truck can be used to carry all the heavy material to and from the receiving and shipping department. As a matter of fact, the major idea in any stockroom layout is to have the arrangement such that an order can be filled in the shortest time possible consistent with minimum cost and efficient handling.

Stockroom Layout

The general problem of stockroom layouts is composed of a few basic facts which are as follows:

- 1—Proper location of departments so orders will flow through progressively.
- 2—Economic location of bins with reference to available space, stock activities and weight of parts.
- 3—Proper size and type of bins for various classes of parts.
- 4—Proper binning of parts by model or item.
- 5—Accurate and rapid methods of locating parts.
- 6—Proper protection for valuable and painted parts.

IN THIS SERIES

Service Profits Depend on —

THE ORGANIZATION

ROUTING OF JOB

BUILDING LAYOUT

EQUIPMENT

PARTS STOCK

STOCKROOM

SERVICE RECORDS

In the larger class of service stations which have multi-floored buildings the freight entrance and exit to the shipping and receiving department is really the determining factor in the floor layout. It is obvious the shipping and receiving departments should be placed as close to the freight exit and entrance as possible to reduce the distance over which one

must transport the heavy shipments by hand trucks. For example, if the shipping and receiving department is to be located at the rear of a stockroom, to insure the best method of handling an order it should start from the opposite end of the building so it will flow through progressively. From this it can be seen that the office in connection with the stockroom necessarily must be located at the end of the building opposite from the shipping and receiving department with the main storeroom for repair parts located in between.

Sales Counter

Every stockroom must have some kind of a sales counter, and it is preferable to locate it just as near the stock office as possible and also to provide a wrapping counter so as to avoid time lost in sending parts to the shipping room for wrapping in case of cash sales. This location also makes it easy to refer to office records when the occasion arises.

In smaller stockrooms it is a good plan to locate the sales counter and the distribution counter to mechanics in the repairshop directly opposite each other so that in case only one person is handling the stockroom he is able to watch both distribution counters at the same time. Bins should be located so there will be at least one aisle through the entire stockroom large enough to accommodate hand trucks to facilitate the handling of heavy parts. The bins carry-

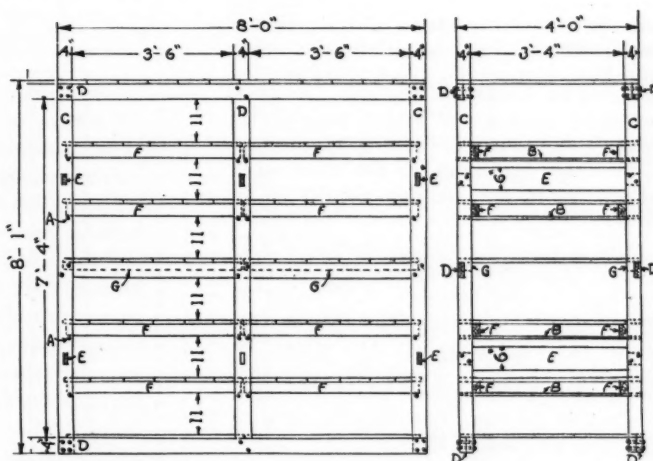
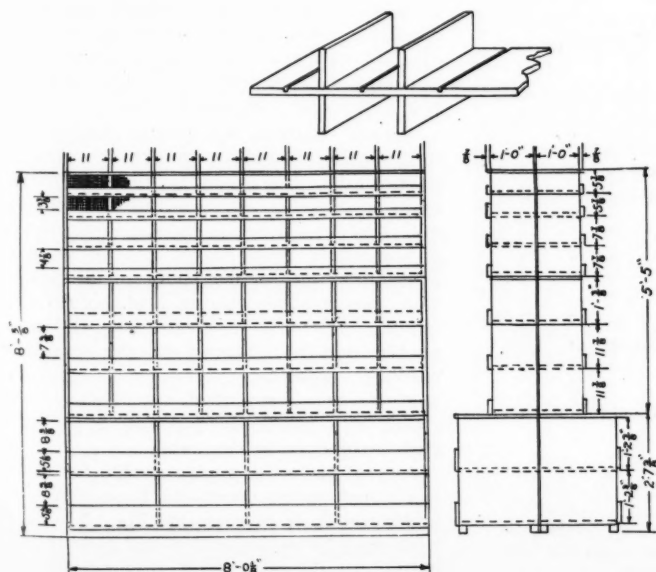


Fig. 2—Parts bins of the medium size comprise about 75 per cent of the storage space in a stockroom

Fig. 3—Heavy parts rack suitable for binning cylinder blocks, gear-sets, shafts, radiators, etc.

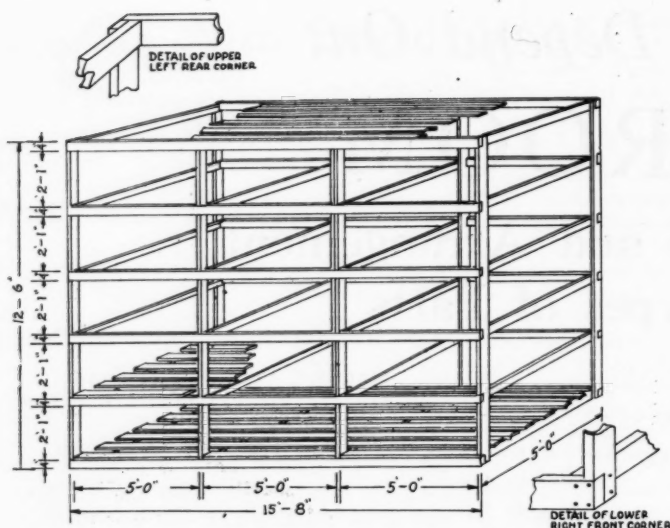


Fig. 4—This is a good rack for binning sheet metal parts, as they require protection of finished surfaces

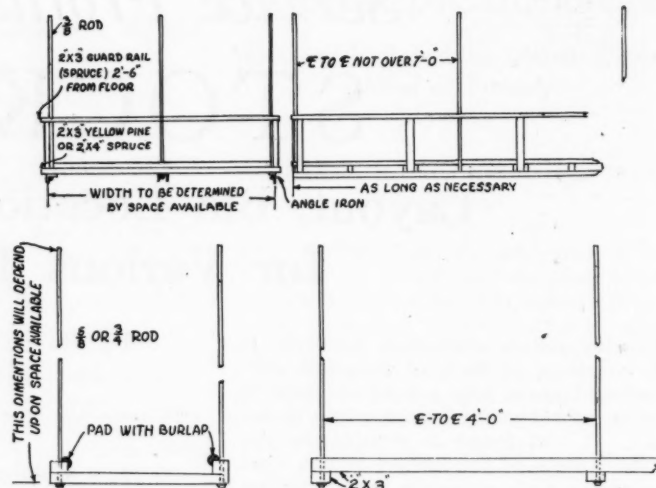


Fig. 5—Space limitations sometimes necessitate hanging racks. Here are two of good design

ing these heavy parts should be placed as near the shipping and receiving room as possible to avoid having to transport heavy parts over a long distance. All aisles, regardless of their direction, in the storeroom should be straight where possible.

Bins should be located so the loss of space will be a minimum. In most cases this will necessitate having a few bins of different lengths. However, as they usually are made in standard sections, it makes little difference. Certain parts are in greater demand than others, and the bins containing these parts should be placed near the main aisle and as convenient as possible. The aisles between the spaces of the bins can be varied above a limit of about 2½ ft. as the size of the parts to be handled increase. From this it will be seen a variation in size of bins to accommodate certain classes of parts will be necessary to utilize the floor space to the best advantage.

Open Faced Types

The open-face type of bin is best suited for the average stockroom as it saves time and energy. The drawered cabinet type of bin for handling heavy parts is very inefficient. For example, if a stock man has to open and close a drawer ten times in an hour and this drawer has to be pulled open a foot and it requires 40 lb. to open the drawer and 40 lb. to close it, then this man is doing 800 lb. of work an hour or in a 10-hr. day, 8000 ft. lb. of work.

This is equivalent to shovelling 4 tons of coal through a distance of 1 ft. in a day and, as can be seen, this would be rather strenuous work. The fatigue factor is very important in any plant, as it is only by these means that our factories have been able to reach the high production they are now capable of with a limited number of men.

Repair parts should be divided up into their respective classes to facilitate binning. To construct suitable bins they may be divided into the following classes:

- 1—Equipment for small parts.
- 2—Equipment for medium parts.
- 3—Equipment for heavy and bulky parts.
- 4—Equipment for sheet metal parts.

Small repairs parts would be those common to electrical apparatus, ignition apparatus, carbureters, etc. A steel rack suitable for binning these small parts is shown in Fig. 1. This rack has 180 drawers specially designed for storing this class of parts. Each drawer can be partitioned on 1-in. centers if desired. Common practice is to divide these drawers into six or eight compartments, which gives for the entire rack 1082 or 1440 different divisions. Each drawer in the rack should be provided with a pull handle and a lateral holder at the forward end. This rack occupies a floor space of 3 sq. ft. and is so designed that additional units may be added from time to time as required. This piece of equipment is an ideal type for storing small parts, considering the space involved.

Most repair parts are classified as medium-sized parts. A bin suitable for storing this class of parts will be used

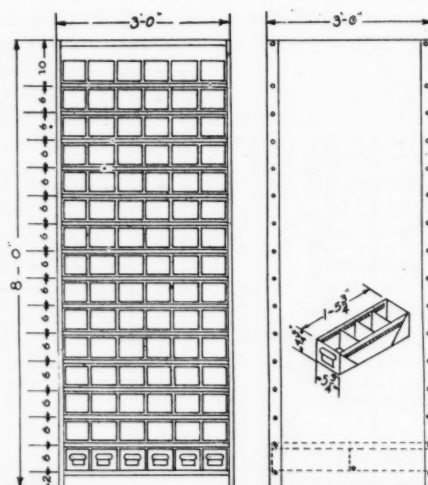


Fig. 1—This small parts rack requires 3 sq. ft. floor space and has a possible 1440 storage divisions

most, and such a bin is shown in Fig. 2. This bin is 8 ft. high, being built that way to eliminate the use of ladders, which is necessary with bins of higher construction. The ladder in a storeroom is a time-loser, as it always is blocking the aisle. Any part of this bin can be reached from the shelf, as the top of it is only 5½ ft. above the shelf.

Under this classification there is some variation in the size of parts, and that is taken care of by having three different sizes of bins. The larger bins are located below for the heavier parts and graduate up to the lighter parts at the upper portions of the bin. While the bin shown in this illustration is slightly over 8 ft. in length, it can be constructed in shorter section to correct for variation in floor space. However, as many as possible can be made of this standard size to suit an individual layout and the remainder of the space filled out with an odd-sized bin.

Construction of Bins

Considerable attention should be paid to the construction of these bins. The division between the faces of the bins should be made of galvanized iron wire of ¼-in. mesh, so the maximum amount of light can pass through the bins. Experience has proved battleship gray is the best color for these bins.

A rack suitable for storing heavy and bulky parts is shown in Fig. 3. Repair parts under this classification are shafts, cylinders, gearsets, radiators, wheels and similar material. Space is provided at the top of these racks for the storage of fenders and other sheet metal parts. The two shelves above and below the center shelf are removable, so the size of bin can be changed in the simplest manner possible. These removable shelves are supported by ¾-in. rods which run horizontally through the upright supports of the rack.

A good design of rack suitable for storing sheet metal parts such as fenders, hoods, etc., is shown in Fig. 4. This rack may be set to run along a wall and extend to the ceiling, if this amount of

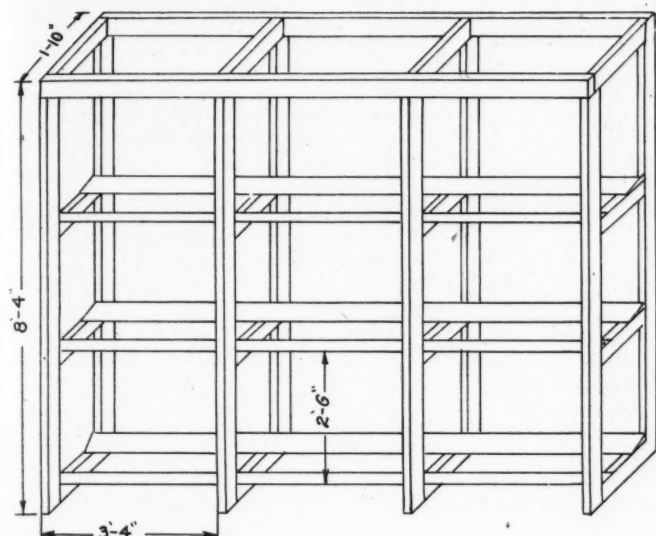


Fig. 6—This rack is designed so that wheels, tires, rims, etc., can be placed in a vertical position to facilitate removing

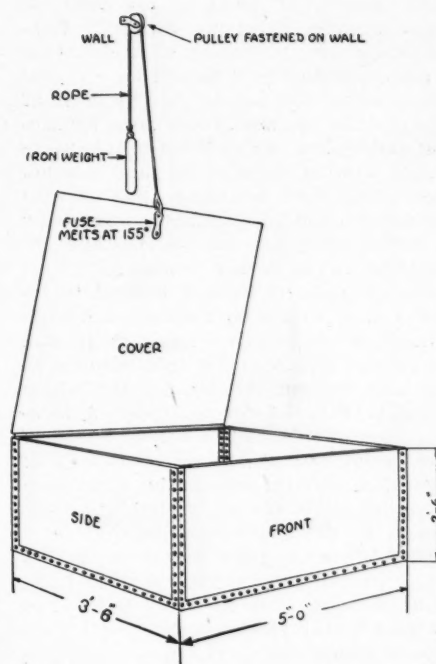


Fig. 7—A fireproof excelsior bin for the shipping room

storage space is required. The lighter and less used parts should be stored on the upper shelves of this rack.

Some cars will have fenders too large for this rack, hence it will be necessary to increase the distance between the partition and probably increase the depth of the rack. However, the construction of the rack is shown clearly, and the method of joining the upright to the base is illustrated in the small drawing in the lower right corner. In the partitions of this rack to be used for the storing of fenders which are not wrapped to prevent them from being scratched it would be well to cover the longitudinal strips with felt or some other soft material which would prevent fenders from becoming scratched. Pine would be the best material to make this rack out of.

In some stockrooms where space is limited it might be advisable to use a hanging rack similar to that shown in Fig. 5 for the storage of sheet metal parts. The chief objections to this kind of a rack are that it is somewhat inextensible. However, it is sometimes necessary to resort to these means in stockrooms where it is necessary to store a certain amount of material in a limited amount of space.

Hanging Racks

Two sizes of hanging racks are shown. The upper rack is for longer material and the lower one for shorter material. It is imperative in the construction of these racks not to exceed the dimensions given between the verticle hanging members. These racks are only designed to carry a certain load, and if this dimension is exceeded, it is liable to cause failure of the rack. Note the running strips of these racks are to be padded with burlap to prevent damage to any painted part.

The rack in Fig. 6 is designed to store wheels, rims and tires and may be modified so it can be used for storing radiators and springs. For storing springs it would be best to increase the depth of this rack to about 4 ft. but leave the longitudinal strips triangular in sections so the springs will rest right side up in the rack. In this manner the

springs can be stored side by side and thus more springs placed in the rack than if the longitudinal strips were flat and the springs allowed to lay on their side. If any of the sections of this rack are to be used for storing radiators, it would be best to cover the longitudinal strips with burlap to prevent damage to the painted parts of the radiator.

The excelsior bin shown in Fig. 7 is a safe means of showing it and is one that conforms to insurance underwriters' regulations. This piece of stockroom equipment is well adapted for use in the receiving and shipping room. It should be

constructed of 16-gage galvanized sheet iron.

One of the features of this bin is the fusible link which connects the cover weight-balancing cords to the cover. In case a fire starts in the excelsior bin, this fusible link will melt at 155 deg. Fahr. and permit the lead to drop, which smothers the fire. One usually can obtain such a link at any electrical or hardware store.

Fig. 8 shows the proper and improper method of numbering bins. In the past it always has been a common practice to letter each section separately and then to number the bins in the section consecutively as shown in the lower part. This is a very poor practice because the bin numbers frequently run in the three figures and are consequently very difficult to locate. This may seem like a small matter, but it really amounts to considerable in a stockroom, as every means must be taken to prevent the waste of energy and time.

Proper Numbering Important

As stated before, the proper numbering or indexing of stock bins is very important. Perhaps the most convenient plan is to number each section separately and then to letter each row of bins. This is shown in the upper illustration. Each row of bins in the rack has a letter assigned to it and the bins are numbered from left to right. Note that in the larger bins they are numbered with odd numbers. The reason for this is that if one ever desires to divide the larger bins into two bins, the whole rack will not have to be renumbered. For example, if it were desired to divide bin 1 into two bins, it simply would assign the No. 2 to the new division.

Thus the location of a bin in the rack would be as S-1 and B-7. This gives the exact location of the rack in the stockroom layout and of the bin in the rack.

It is very important that there be some

SECTION A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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SECTION A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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The upper section illustrates the correct way to designate bin locations and the lower, the incorrect method

rapid means of locating the bins in which specific parts are located. First the stockroom inventory card referring to one individual part should have a provision on it for noting the location of this part in the stockroom both by section and by bin. In addition to this there should also be a stocked part location book. This book would be made up with the parts numbers running consecutively in one column and the sections and bin locations in the other column.

For example, if it were desired to locate a part No. 936 by running down the column of consecutive numbers to 936, we should find opposite this number in the next column the bin located which would be F-1, G-5 for example. A location book of this nature will be found of great value in a stockroom, especially at the sales counter, where the stockroom inventory cards are not available for reference to determine the location of a part. When a part salesman makes a sale he can refer to this book and immediately determine the exact location of the part in the stockroom.

Much money can be lost in a stockroom through damage to painted parts. Therefore, it is essential that every precaution be taken to prevent fenders, hoods and other painted parts from becoming scratched. Hence, it is important that all bins and racks which are to store finished parts should be protected with burlap, felt or some other soft substance which will not mar the finish of these parts.

"YELLOW" TO GO TO LIVERPOOL

Chicago, Sept. 30—"Yellow cabs," the Chicago taxicab service which are noted throughout the United States as among the most efficient and economical public vehicle systems in the world, are shortly to make their appearance in England. An order for 150 of these cabs was received this week by the Shaw Mfg. Co., builders of the machines, from an English firm which proposed to institute a taxicab service in Liverpool similar to that in Chicago. The Shaw concern has also received an order for a number of touring cars from Barcelona, Spain.

BUILD BOAT FOR MOTOR CARS

Buffalo, N. Y., Oct. 2—Construction of a vessel to be used exclusively to transport motor cars is planned by the Detroit and Cleveland Navigation Co. Frank E. Kirby, marine architect, has been engaged to design the steamer which will be an oil burner. The boat will be equipped with elevators to facilitate loading on the upper decks and in the hold and will be ready for her first run in 1921.

The D. & C. Co. announces that so many tourists are now shipping their cars by boat between lake ports that passenger steamers have been forced to accept new cars for shipment east. The construction of the steamer will make Buffalo the largest interchange point in the east, it is believed, as the vessel will ply between Detroit and Buffalo on her regular run.

River Highway Organized

Mississippi Association Formed to Improve Roads Along Great Stream

Goes From St. Paul, Minn., to New Orleans, La.

MEMPHIS, TENN., Sept. 30.—With every mile of the Mississippi River Scenic Highway, from New Orleans to St. Paul, under a division organization, the annual meeting of the Mississippi River Scenic Highway association, held here Sept. 16, marked the real beginning of the campaign for this highway, construction of which is largely due to motor car and truck owners and motor car dealers from St. Louis to New Orleans.

The association has been incorporated for some months, but detailed plans of raising funds and construction as well as an extensive publicity campaign were discussed and decided on at the meeting here. Truman Pierson, president of the association, had just completed a tour of inspection of the route of the highway between Memphis and New Orleans and attended the recent meeting at Vicksburg where the southern division was organized, so he was in a position to make a detailed report to the annual meeting here.

Want Year-Round Highway

The aim of the association is to construct a hard-surfaced, readily traversable highway for every day in the year, from St. Paul to New Orleans. Federal, state, county, parish and municipal aid, as well as the help of all automotive associations and all individual motorists, is being enlisted throughout the length of the highway. The Mississippi Valley association and the Mississippi Valley Waterways association are assisting, as are also the branches and the parent body of the Louisiana-Mississippi Automotive Trade association, recently organized in New Orleans.

The proposed highway parallels the river. Beginning at New Orleans, it runs up the east bank of the river through Baton Rouge, Natchez, Vicksburg, Greenville and Memphis and there crosses on the first passenger bridge to the west bank, thence continuing northward.

BOISE HOLDS MOTOR SHOW

Boise, Sept. 30.—The first show of the Boise Auto Trades association, and the first show of any consequence ever held in Idaho, was held last week, September 22-27, in connection with the fifth annual state fair. Twenty exhibitors took part and 31 makes were represented, most of them by 1920 models furnished by the factories for the occasion. The show was greatly hampered by inability of the dealers to get cars. Two firms unable to get a car of any kind in their line, even by offers to pay owners for use of their cars a few hours each day, were compelled to leave their spaces vacant.

To house the show the largest tent

which could be found in the state, measuring 60 by 250 ft., was used, and every inch in it was taken. The dealers were allowed three cars each. No accessories were shown because of the lack of space, but many dealers supplemented their car exhibits with displays of motor parts and engine cut-aways.

The success of the event was a reflection of the almost unbelievable increase of automobile users in the state. In 1913 only 2083 cars were registered. Last week, with more than three months yet to go on 1919, the 41,000 mark was passed, an increase in six years of approximately 20,000 per cent. Last year 32,281 cars were registered. The registration this year, therefore, is more than 25 per cent over last year's mark.

CHAUFFEURS THREATEN TO STRIKE

Philadelphia, Sept. 27.—The International Brotherhood of Teamsters, Chauffeurs, Stablemen and Helpers of America, Local No. 470, comprising about 1500 men, drivers and helpers, have demanded an increase in wages from the Philadelphia Team Owners' Protective association, which includes 120 employing draymen in this city. The chauffeurs demand a weekly wage of \$30 for driving trucks not exceeding 3 tons, \$33 for trucks not exceeding 5 tons, and \$35 for trucks exceeding 5 tons. The employers' association has taken the question under advisement.

HERE'S A NEW STUNT OF THIEVES

Buffalo, N. Y., Oct. 1.—A new type motor car thief has just been arrested in Buffalo. This man would follow and obtain the motor and car numbers of newly purchased cars. He would then hasten to the Buffalo branch of the New York State automobile bureau and obtain a license for the car, using the proper numbers but a fictitious name and address. Three cars are said to have been stolen by this thief before the owners obtained licenses. With a license apparently made out properly the thief had little difficulty in disposing of the new machines.

DEPARTMENTS GET WAR CARS

Washington, Sept. 28.—A bill has been introduced in the Senate authorizing the Secretary of War to transfer free of charge a number of motor propelled vehicles and motor equipment to the Department of Agriculture for use in the improvement of highways, to the Post Office Department for use in the transmission of mails, to the Navy Department upon request of the Secretary of the Navy, and to the Treasury Department for the use of the Public Health Service.

LINCOLN MOTORS INCREASES STOCK

Detroit, Sept. 27.—The capital stock of the Lincoln Motor Car Co. has increased from \$900,000 to \$1,400,000. The Lincoln Motor Car Co. is one of the concerns which made Liberty Motors during the war.

Motor Age Wiring Chart No. 48

Connections on 1914 Case.
The Westinghouse two-unit
system is used.

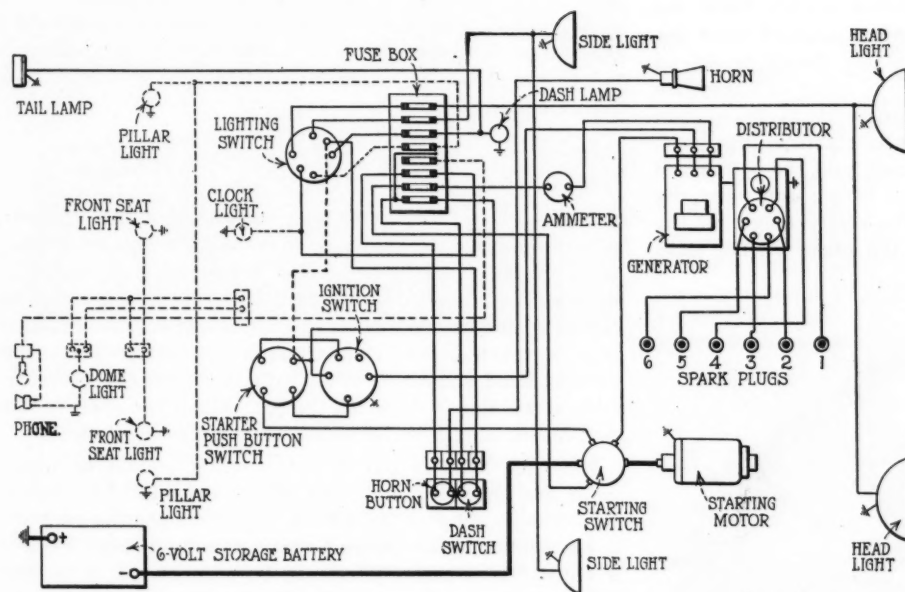
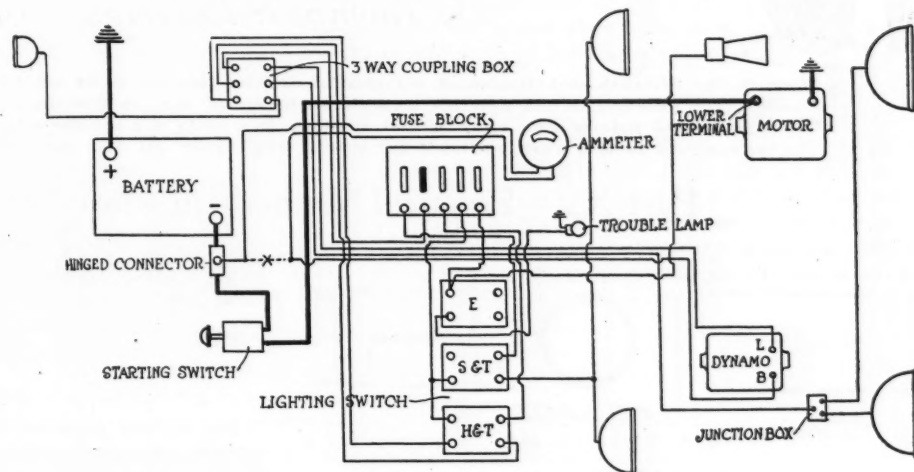
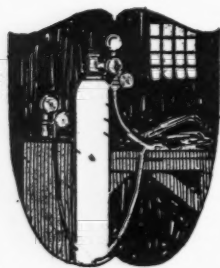


Diagram of the wiring connections on Pierce-Arrow-series B-4. Dotted connections indicate limousine models

Abbott—March 20-27
Alco—April 24
Alter—Nov. 4
Apperson—March 6
Buick—Nov. 21-April 3
Cadillac—Dec. 9
Cartecar—May 1
Cole—Jan. 23-April 3
Case—Feb. 27
Chalmers—Feb. 20-Mar. 27
Chandler—April 3
Chevrolet—Nov. 28-Mar. 27
Crow-Elkhart—June 26
Davis—May 8
Detroitter—March 6
Dodge—Dec. 12
Dort—March 13
Elgin—Feb. 27
Empire—March 18
Ford—Jan. 30-Feb. 6-May 15, 22
Franklin—June 19
Grant—Feb. 28-Mar. 27
Haynes—Sept. 4-1

Henderson—April 3
Hudson—Dec. 5-May 1
Hupmobile—Feb. 13
King—July 3
Krit—Feb. 6
Lexington—April 24
Little—March 20
Locomobile—Jan. 23-Apr. 17
Maxwell—Jan. 16-Aug. 14-Sept. 11
Marion—March 6-20
Mercer—Jan. 23-Aug. 28
Michigan—March 20
Mitchell—Jan. 9
Murray—May 1
National—June 19
Oakland—Jan. 2
Oldsmobile—Jan. 23
Packard—June 19-July 31
Overland—Nov. 7-14
Owen-Magnetic—Sept. 8
Palge—July 3
Paterson—July 3

Paterson—Mar. 20—June 26
Premier—April 10
Pullman—April 10
Pullman—April 10
Regal—Feb. 6-April 10
Reo—Feb. 27-Aug. 21
Saxon—April 17
Scripps-Booth—Dec. 26
Simplex—April 17
Stanley—June 26
Stearns-Knight—April 24
Studebaker—Dec. 26
Stutz—Jan. 23
Velle—April 24-Sept. 25
Westcott—May 8-Sept. 25
Special Systems for Fords—May 15-22
General Battery Charging—May 29
General Battery Charging—May 29-Sept. 25
General Magneto Diagrams—June 5
Internal Connections—July 10-17-24



Autogenous Welding in Automotive Repairs

By Thomas P. Bowman



This is the fifteenth installment of a series of articles that are to be published in MOTOR AGE each week. The author has had practical experience in motor car repairshops which enables him to present first-hand information on practical welding in a clear and concise manner. No difficulty should be encountered in this work, provided the reader will apply all the methods given herein.—Editor.

Part XV—Practical Methods in Plate Welding



Fig 6—Method No. 26A

METHOD NO. 26-A

TO GET experience in vertical welding of plates, after No. 26 has been completed, cut the plates in two. Bevel the edges and set the two halves in a vertical position with the edges to be welded horizontal. These plates should be set up so at one end they are together and at the other end they are $\frac{3}{4}$ in. apart. Use a No. 10 welding head, with 21 lb. oxygen pressure. Use a 3-16-in. welding rod. In starting this weld, heat the edges until they are melted, then hold the filling rod into the V. Use the swinging motion as before and move the flame around the filling rod. Be sure the entire length of the seam is completed as in No. 25. In case the edges will not close

up, slow down the welding and if the edges, after passing the center, should close up too much, increase the speed of the welding. Do not point the welding flame too much to the top edge of the seam.

METHOD NO. 26-B

For further practice in vertical welding of plates, after No. 26-A has been finished, cut the plate in two and bevel the edges to 45 deg. Then set the plates up on end vertically. Set the plates together at the bottom edge and spread them $\frac{3}{4}$ in. at the top the same as in the three preceding methods. Use the same size welding head. The welding should be started from the bottom and carried upward without stopping until the welding is completed, the same method to be used as in 26-A for taking care of contraction.

METHOD NO. 27

In welding a plate metal tank such as is used for metal containers the plate first is rolled into the form of a cylinder. The edges of the seam to be welded are beveled at 45 deg. The same method of making a longitudinal seam is used in No. 24, except in this case the plate is heavier and it is necessary more care be taken in securing a sound, thorough weld. A No. 7 welding head should be used, with 16 lb. oxygen pressure and a $\frac{1}{8}$ -in. welding rod for all the job. When the shell is finished the bottom should be beveled on the flange as shown.

After the head is put in the shell, it should be tacked in about five places to hold it in place. See No. 13 for tackwelding. The welding of the bottom should be carried on the same as on welding $\frac{1}{4}$ -in. plates. While this is an edge weld, yet it is V'd out so a better joint may be secured. A $\frac{1}{8}$ -in. welding rod is used, and it is held in the V. The blowpipe is swung around the rod exactly as in welding $\frac{1}{4}$ -in. plate. It is necessary, of course, that the bottom of the V be melted before the welding rod is added.

The entire head is welded by this means as quickly as possible. Because only one side of the joint is beveled, care must be taken that the melted welding rod is not dropped onto the cold surface. When the bottom is welded in, the head next is tacked to the shell. This should be tacked in about four places. The shell and head both are beveled to give a butt joint. The joint then is made exactly the same as in welding the $\frac{1}{4}$ -in. plate metal.



Fig. 70—An 800 lb. gear of which two teeth are broken. The gear measures 44 in. in diameter, 6 in. wide, the teeth being 6 by $1\frac{1}{2}$ by $1\frac{1}{4}$ in. The lower photograph shows the gear teeth built up by welding and later machined, making the gear practically as good as new

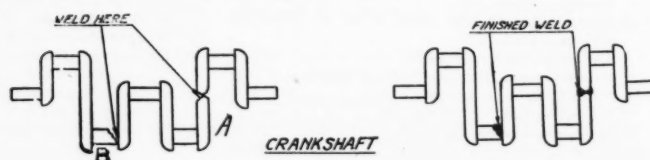


Fig. 7—Method No. 28

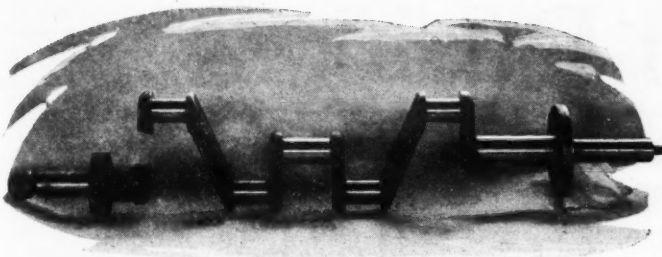


Fig. 72—Broken four-pin crankshaft

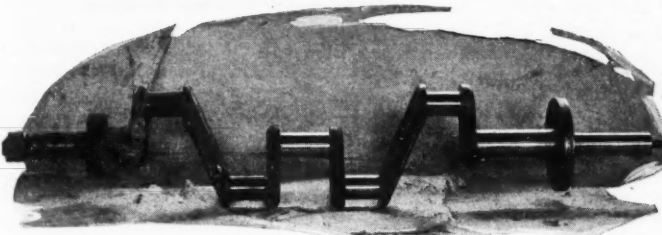


Fig. 73—Crankshaft after welding

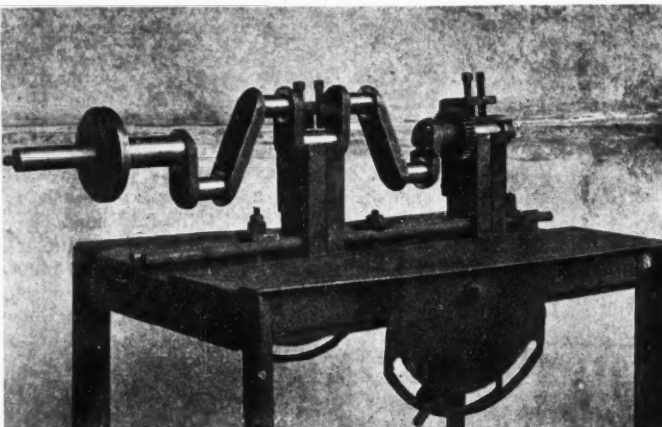


Fig. 74—Break properly V'd and crankshaft lined up in jig table

METHOD NO. 28

No. 28 is to give practice in the welding of crankshafts. A crankshaft either breaks in the web A or in the pin B.

The breaks usually take the form shown in the diagram. It is necessary that in welding parts of this kind care be taken to keep them in line. This can be done by setting the shaft up on V blocks or a face plate with screw clamps. Before welding the set-up of the job should be checked over with a straight edge in order that the parts be properly centered and in line.

In welding a break such as is shown at A, the break should be V'd out about 45 deg. clear through to one side. This weld must be made vertically. A No. 10 welding head, 21 lb. oxygen pressure, and $\frac{1}{4}$ -in. filling rod is melted into the V. A perfectly neutral flame is used all the way through the welding. The weld should be reinforced about $\frac{3}{16}$ in. and when finished should be hammered slightly with a light hammer. This hammering should be done while the weld is still hot but never should be carried on after the metal has reached a dark red heat.

After this is done, go over the back of the weld and give it a reinforcement of about $\frac{3}{16}$ in. metal. When completed apply the same hammering treatment.

When the break is in the pin, as at B, a V should be made from one side, two-thirds of the way through, and then lined up and welded by the welding flame. The other side is melted out with the blowpipe flame until it reaches the weld from the

first side. It is important that the first weld be reached and that a good joint be secured at this point. The second V then is welded. This weld should be reinforced about $\frac{3}{16}$ in. around the pin, and care must be taken that the edges at the top of the weld are melted thoroughly. The weld should be hammered all around, as previously described. The pin will be machined afterward. For this reason it is necessary that enough metal be present to allow for a good cut; also the character of the metal should be good and solid, and there should be no scale or blowholes in it.

After the crankshaft is welded it is always a slight bit out of line. It is put in the lathe then and straightened. This straightening can be done by heating with the blowpipe. A No. 10 or No. 12 welding head is used, and the shaft is heated at the place where it is out of line to a dull red heat, and then straightened by pressure from a crowbar or screw jack. After straightening, the job should be allowed to cool off slowly. Slow cooling can be given to it by wrapping a piece of asbestos paper around it.

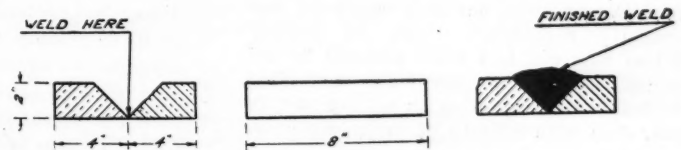


Fig. 75—Method No. 29

METHOD NO. 29

The object here is practice in the welding of cast iron.

Prepare a sample with a 45 deg. bevel. Place the two beveled edges together. Use a No. 12 welding head with the proper oxygen pressure. See welding table in article No. 1. Use $\frac{1}{4}$ -in. cast-iron filling rod.

Cast iron always is welded with a flux, a chemical compound added with the filling rod to prevent oxidation and to remove impurities. But to show the purpose of the flux, the sample should be welded first, without it, and with it in a second attempt.

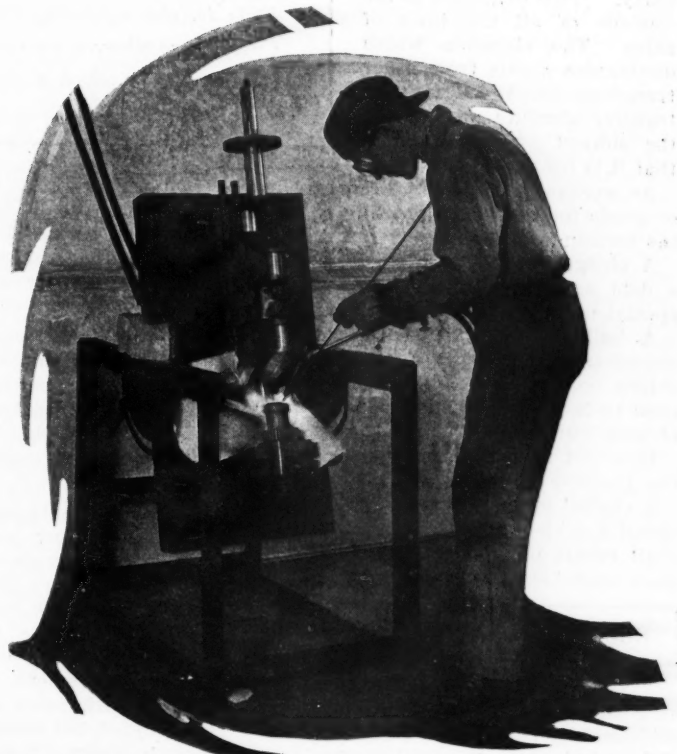


Fig. 76—Method of welding. Note the flame of the preheating torch is removed during the welding operation

Law in Your Business



By Wellington Gustin



UNIFORM SALES ACT

WHAT is known as the Uniform Sales Act has been enacted in several states and is being adopted in others. This is not any adoption of new fundamental principles but only codifying universally recognized rules of selling. When this act has been adopted by all states, citizens of one state may deal with those of any other in selling just as they deal with citizens of their own communities.

It would seem there could be no misunderstanding of the legal principles involved in sale of goods. Courts, however, prove this to be erroneous.

TERM "SALE" DEFINED

In its general sense, a sale is a transfer of property for money or its equivalent. In its restricted sense it is defined by Bouvier as "an agreement by which one of two transacting parties, called the seller, gives a thing in exchange for a certain price to the other party." This definition is the nucleus of all the laws of sales. The elements which distinguish a sale from other transfers lie in that they transfer absolute property in the subject of the sale and that it is for a price.

An exchange or barter is an exchange of goods for other goods, while in a sale the exchange is for money.

A pledge is a bailment made to secure a debt and the pledges secures only a special property in the thing pledged.

A bailment results where goods are placed in the hands of another, who receives possession for a particular purpose to be returned upon consummation of such purpose.

In a gift no consideration is given for the transfer of title.

A chattel mortgage passes title only as security subject to the provision that title shall revert in the one giving the mortgage upon his satisfying its terms.

ELEMENTS NECESSARY IN SALE

A valid sale rests upon the same requirements as any other contract. The subject matter of a sale is called "goods" and includes all personal property except money. These goods must be in ex-

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. Motor Age in this and others of a series of articles will take up some of the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

istence, although contracts to sell may involve either existing goods or goods thereafter to be manufactured or acquired by the seller. If one contracts for the sale of certain goods which, without the knowledge of either party, have ceased to exist at the time, the contract is void.

The consideration on which the con-

sonable time has elapsed. An acceptance must be unconditional and identical with the offer. If it differs from the original offer to such an extent as to constitute a counter offer, there is no contract.

Where an offer is made by mail the contract is complete as soon as acceptance is placed in the mails, and an offer by telegraph, when accepted and the acceptance delivered for transmission becomes a binding obligation. An order for goods to be delivered to the buyer becomes binding when goods are so delivered. Here transmission of the acceptance is not necessary. But until such goods are shipped or delivered there is no acceptance of the offer unless it is communicated.

A sale or a contract to sell may be made in writing or by word of mouth, or by both, or it may be implied as a matter of law from the acts and conduct of the parties. An important exception must be noted here, that being in those cases where the statute of frauds requires the contract to be in writing.

The matter of title and whether it has passed between the parties has been the determining point between litigants in many important cases. What one should do concerning goods in dispute depends upon this question. Persons have sold goods to which they had no

title and others have attempted to collect where the courts have found title has never passed and the apparent debtor not liable. Necessarily this article can outline only the broadest fundamental principles of sales, but it will be amplified and illustrated by the latest court decisions from time to time.

ILLINOIS LAW UPHELD

In a case testing the validity of the Illinois motor vehicle law, the defendant was the general manager of a Chicago firm engaged in attaching truck units to car units and converting them into trucks. He ordered his workmen to change the engine numbers of six new cars which had just been delivered to him. No explanation was made for changing the numbers.

Upon conviction, the defendant appealed to the supreme court and attacked the constitutionality of the motor vehicle law, which prohibits changing or remov-

*This week Mr. Gustin,—
Defines "sale" and tells wherein it differs from other bargains.
Tells decision upholding Illinois motor law.
Cites a case where a guarantee is upheld.
Quotes case in which a refund of purchase price was required.*

tract of sale rests is a price in money. This price may be paid or promised. Unless both parties have agreed upon the price, or upon a means by which the price may be definitely ascertained, there can be no sale.

As in all other contracts there must be an offer and intent to sell on the one side and an intent to purchase on the other. A proposal which amounts to an invitation to do business cannot be turned into a sales agreement by acceptance.

Advertisements, price lists and circulars, announcing goods for sale at certain prices, are usually mere invitations for offers. Here the intention governs, and the language employed, coupled with the circumstances surrounding it, may make it an offer which may become a binding agreement. Ordinarily an offer may be withdrawn at any time before it is accepted, but notice of such revocation must be given. If no time is fixed for its expiration, an offer expires after a rea-

ing manufacturers' serial numbers from motor vehicles. He urged that this section violated the state constitution, as well as the constitution of the United States, in that it deprived him of his liberty and property without due course of law and denied him the equal protection of the law.

In reviewing the case the court held that the police power of a state is an attribute of sovereignty and that it rests with the legislature to decide when its exercise is necessary to meet existing evils. Other contentions were overruled.—People vs. Johnson, 123 N. E. 543.

GUARANTEE CASE IS CITED

The remedies of a buyer of a motor vehicle upon breach of warranty are laid down in a recent case. A man purchased a truck, representing to the agent that he desired a truck suitable for hauling freight and merchandise over a certain state road about 40 miles. The agent agreed to furnish a suitable truck as guaranteed by the terms of contract.

The buyer alleged the truck as received by him did not come up to the specifications in that it did not have a maximum live load capacity of 10,000 lb. and was therefore of no use to him and caused him to lose both trade and customers. Being unable to induce the manufacturer to receive the truck back, he used it for fifteen months, when he sold it and brought suit against the seller.

The court held that upon a breach of the warranty two remedies were open to the buyer, either to return the chattel within a reasonable time after discovering the breach and recover the amount paid, or retain the chattel and sue upon the contract for damages resulting from the breach of warranty.

WHERE REFUND IS REQUIRED

In a Pennsylvania case the dealer sold a car under agreement that if the car was not satisfactory the purchase money would be refunded or another car given instead; and if the second likewise proved unsatisfactory, same might be returned and the dealer would refund all the money he had paid. The purchaser testified that the first car was not satisfactory and was returned, at which time he received a larger car, paying the dealer the difference in price. The purchaser claimed this car, too, was unsatisfactory. He repeatedly offered to return it but was requested not to do so but to allow the seller to remedy to seller and suit brought to recover the amount paid.

The dealer contended that the purchaser was obliged to return the car promptly after his discovery that it was not satisfactory. The purchaser answered that he retained the machine at the solicitation of the dealer to allow

him to make it satisfactory. The court held the law applicable to be that "he who requests another to act, or not to act, cannot punish that other for complying with the request."

On the question as to whether the car was satisfactory the trial court instructed the jury that the purchaser must have "some reasonable objection that would make him dissatisfied with it," and if the defects in the machine were "such as could be remedied by some ordinary adjustment which defendants testified they were willing to make" the refusal to keep it would not be reasonable. But the supreme court overruled this, saying that it has been held uniformly that such objections need only be made in good faith and not merely capriciously to justify the returning of an article, because it violates a contract that it shall be satisfactory. Judgment against the dealer was affirmed.

DETROIT, Editor MOTOR AGE—No doubt your unfavorable comments on kerosene carburetion, under the editorial "The Kerosene Maelstrom," in the July 24 issue of MOTOR AGE, were made in all good faith, but the statements were so sweeping that we must take exception, insofar as they might apply to our own product. The following paragraph is called to your attention:

We realize now that kerosene is difficult. Burning methods must change. What factors will change we do not know exactly. So let us not deceive ourselves into thinking that we are burning kerosene successfully, for we are not. When rapid changes in tractor drawbar load can be handled without having the engine falter, hesitate, gasp, emit volumes of unburned gas and then, in a dying state, recover itself, we will have near perfection.

In taking exception to this statement, we might first call your attention to the fact that there are over 50,000 Holley kerosene carbureters in use on three different makes of tractors.

These installations have operated so successfully that we have no reason, in any way, for changing our method of burning the kerosene charge.

The Holley All-Fuel carbureter is successfully burning kerosene oil as tractor fuel. Rapid changes in tractor drawbar load can be, and are being, handled without having the engine "falter, hesitate, gasp, emit volumes of unburned gas, etc.," nor are we having any other difficulty in the way of carburetion.

With our carburetion system it is possible to shift from gasoline to kerosene in less than 60 sec. after starting. A tractor equipped with this carburetion system will run on kerosene without smoke.

In some cases we have shown horsepower equal to that developed by gasoline carbureter equipment.

OPTION BINDS SALE CONTRACT

Q—I bought a second hand Ford car from a man and offered a check for \$385, the price wanted for the car. He refused to take a personal check, but took \$5 to bind the sale and I promised to bring the cash the next day. I was there at the appointed time, but found out that after I had left someone else offered him \$425 for his car, which had already been sold to me for \$385. Can I collect the difference between the price I paid for the car and the price it was finally sold for? I have his receipt for \$5 and he is still holding my deposit.—A Reader, Chicago.

A—Assuming you have a valid contract, as the facts would indicate, you are entitled to damages for breach of the contract with you. It appears only the amount of damages need be considered.

"The Kerosene Maelstrom"

In any case we can show within 10 per cent of the horsepower developed by any gasoline carbureter. We can operate at a cost approximately 40 per cent cheaper than where gasoline is used as fuel.

We can bear out these assertions in actual tests, and we will be glad to demonstrate the facts to tractor buyers or tractor manufacturers.

In your leading article of the July 24 issue you made statements which were in marked contrast to the editorial quoted when, in speaking of the poor showings in the short-time tests at the Wichita National Demonstration, you said:

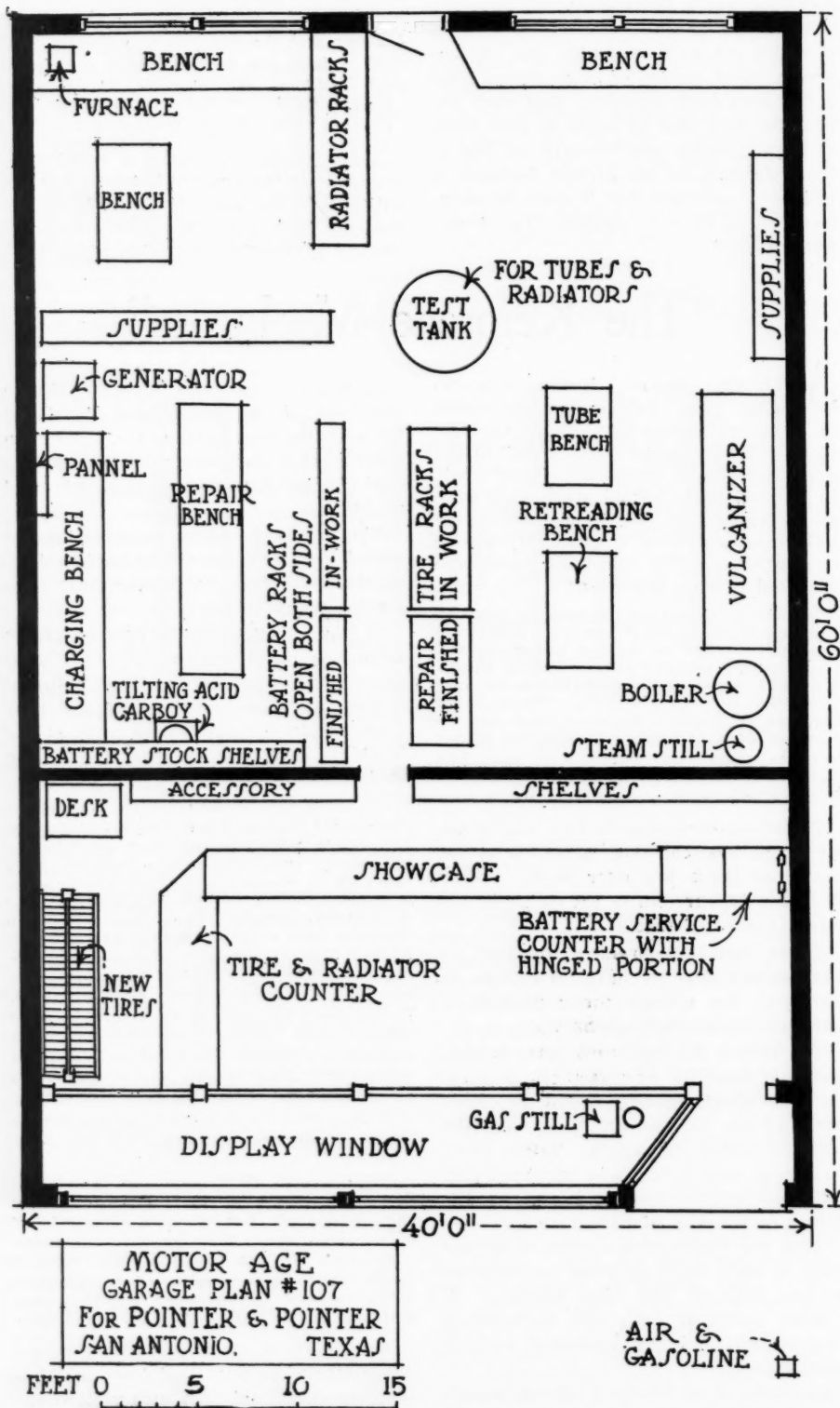
An illuminating contrast to this inconsequential display were the two real tractor trials which culminated at Wichita this week. One of these, the Parrett plowing test, in which 127 acres of wheat were harvested, was under supervision of the state college. The other was the Fordson test staged by the Wichita distributor, in which a continuous operating trial was made under the supervision of the Wichita Chamber of Commerce. Both were so arranged as to give results which were really valuable, and the amount of interest displayed and business prospects coming therefrom are indicative of their value. The Fordson distributor and the Parrett company in particular are to be complimented on the foresight they used in making these trials.

Not only do they serve as wonderful demonstrations of what these two tractors can accomplish, but what in reality is of more importance, they provide the manufacturers of the Fordson and Parrett machines with a wealth of information which will be immensely valuable and which could be obtained in no other way.

We desire to state that the Fordson demonstrated in Wichita did use the Holley vaporizer and was using kerosene oil.—George M. Holley, president Holley Carbureter Co.

Garage Planning

Service Station Arrangements



This garage plan, for Pointer and Pointer of San Antonio, Tex., is so arranged that each department has its own place in the establishment

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquirers are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

No. 107

Allowing Space for Departments

Q—We are planning to build a radiator, storage battery, vulcanizing and tire service station on plans sketched herewith. The estimated size is somewhere in the neighborhood of 40 by 60 ft., possibly smaller, if arrangements can be made to supply ample room for each department. If you can help us to eliminate floor space that is not necessary to carry on a medium-sized business of this nature, it will be a great help to us and save us many dollars, no doubt. We also, if possible, would like an estimate on what it will cost as per your plans.

We wish to build this service station with a rough brick front, hollow tile sides and rear, skylight and some kind of good flooring for retail department and concrete floor for other departments.—Pointer & Pointer, San Antonio, Tex.

We believe your experience will determine the division of space between the departments in this shop, that is, the amount of business each department does will decide how large its share of floor space will be. Of course, tires are bulky and need more space than batteries, and the battery repairs in a certain community always will be greater than the radiator repairs. Consequently, we have given the tire department the bulk of the space with batteries and radiators in diminishing proportion.

In this respect, we advise a consid-

erable flexibility until your business gets established and to gain this flexibility, we show the partitions between the departments as not partitions at all but made up of racks and banks of shelves which can be moved about as need demands. In fact, the only parts which are stationary are the charging bench, the vulcanizers and still, some of the wall shelves and the two benches at the rear.

Your door to the repairshop should be behind the counter to keep idlers from going in and interrupting the men. You should have a good show window. L. S. Armstrong, in the Aug. 7 issue of *MOTOR AGE* recommends that the water still be set up in the show window. It will attract attention, and it might be a business getter to offer, as some do, free distilled water just as you give free air for tires.

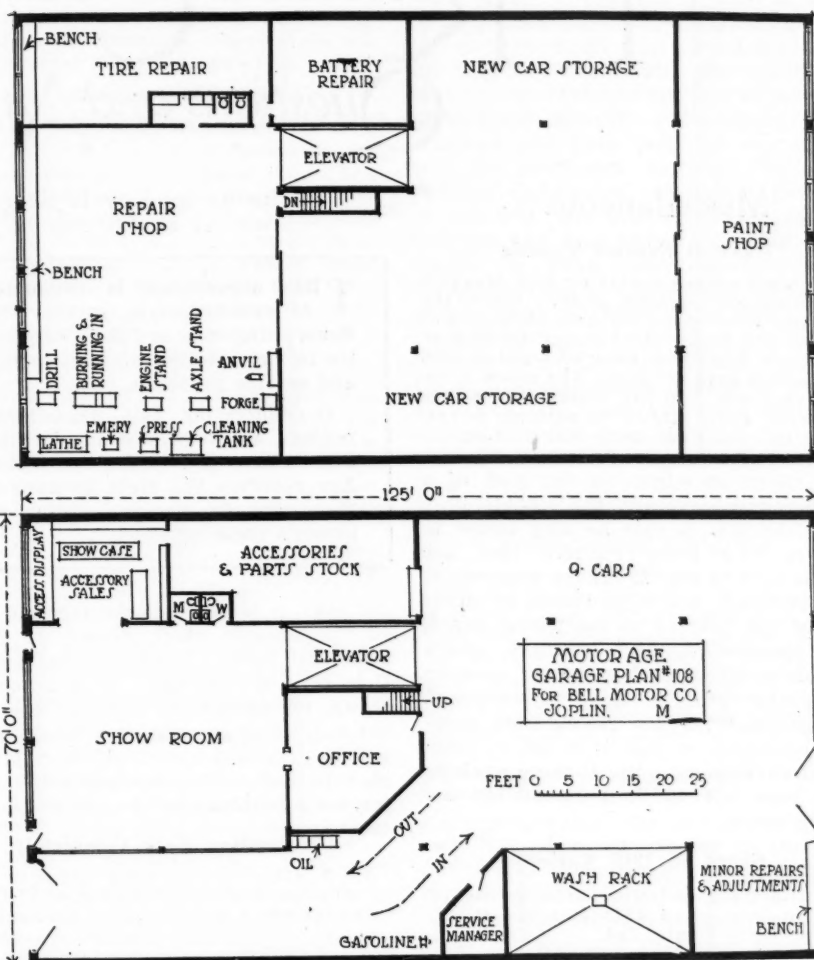
No. 108

Cannot Give Specifications

Q—We are going to build a sales and service station. The lot is 70 by 125 ft. The building will be two stories. We would like to have you give us that information you can in the way of plans and specifications.—Bell Motor Co., Joplin, Mo.

We cannot give you any specifications, as that is more than we attempt to do. We, however, have made a layout for a two-story service station on a lot 70 by 125 ft. It is not as complete as it might have been had you given us more details to work with. The posts might be eliminated on the upper floor by trussing the roof.

If more room is desirable in the office, it can be gained at the expense of the showroom, which is probably larger than necessary unless a large line of cars is carried.



The Bell Motor Co. can change this plan slightly to get more room in the office, but the showroom will be reduced in size somewhat

Holland Distributer Tells of Situation Abroad

Here Looking for Agencies That Can Send Him Cars and Trucks

NEW YORK, Sept. 30—"An automotive dealer with a motive, but without anything to sell," is the way in which Philip J. Stokvis, managing director of W. J. Stokvis, Ltd., of Arnhem, Amsterdam and The Hague, Holland, describes himself. He is here to amend the latter condition by arranging agencies for cars, trucks and motorcycles.

Stokvis is no novice. He commenced with a plain-bearing bicycle in 1885, and has been agent for the British Humber company since 1887. In 1895 he took over the Dunlop Tire Co. agency for Holland and in 1897 commenced relations with the United States by importing Gormully & Jeffery bicycles.

In 1898 the firm imported a two-cylinder English Daimler with solid tires and in 1900 Philip Stokvis, accompanied by Scheltema Beduin (then the world's tri-cycle champion) drove a pneumatic-tired Daimler to Switzerland and back.

Stokvis has held the Panhard agency since 1901 and has imported Dodge, Jef-

fery and National cars until overseas trade was stopped in 1917. He is president of the dealers' section of the Netherlands Cycle Dealers' Association.

Years of experience of European conditions in the automotive industry, past and present, indicate, in Stokvis' opinion, that there is little improvement likely in the near future. He has traveled widely throughout the continent in the last few months, visiting manufacturing centers, and his conclusion is that it will be many months before production gets under way.

Even when cars and trucks are available in appreciable numbers, the European dealers' troubles will be far from at an end. Prices have sky-rocketed to a point where the car has become a luxury, available only to the select few. Truck prices may advance to such an extent that operation without actual loss will be impossible.

There is one point which Stokvis wishes to emphasize while in this country of enormous distances. He finds the aver-

age American export man is inclined to forget that the population of Holland is considerably less than that of New York and that its area is but little more than half that of Lake Michigan. For these reasons, says Stokvis, the country can be handled best by a single responsible distributor or dealer. He mentions Holland because his primary interests are in that country, but points out that there are other small countries in Europe in which similar conditions prevail.

Hitherto licenses granted in Holland have been based on cylinder bore which is to the disadvantage of the low-priced car with a bore of more than 3½ in. A case in point is that of the Ford, which has been so over-taxed on account of its 3¾ in. cylinder bore that there are but few in use. A new law which goes into force next January, will amend the registration regulations.

Stokvis expects to remain in the United States until early in October.

The Readers' Clearing House

Questions and Answers

Miscellaneous

Maxwell Gearset Trouble

Q—What makes a 1917 or 1918 Maxwell jump out of high gear? When the shifting lever is pulled into high, it will not go into mesh. A new high-speed gear and a new drive gear have been put on this car, and it does not help. The gears work free on shaft, and the clutch works free on drive gear. There is nothing wrong with the shifting fork.—Lloyd Leefers, Carlinville Garage Co., Carlinville, Ill.

A slight oversight on the part of a mechanic is generally the trouble in a case like this in that he may forget to replace two little washers that are shown at A in Fig. 2. These washers, as will be noted, are to be placed at either end of the bushing in the pocket gears. The absence of these washers, which are about the size of a quarter, permits the pocket gear to move forward and this prevents the dog clutch from properly engaging, so that it is apt to jump out of engagement. See if these washers have been left out in reassembling the transmission.

Gears on 1913 Marion

Q—Illustrate and give adjustments of steering gear on a 1913 Marion.—E. W. Sutton, Terre Haute, Ind.

A Warner gear was used on this model of the Marion and calls for simplicity in the matter of adjustment. By referring to Fig. 3., the idea will be clear. Immediately at the top of the housing of the steering gears proper will be found a bolt that holds the halves of the case together, as shown at A. Loosen this locknut thereon, and this will permit you to turn the adjusting nut B—to the right to tighten and to the left to loosen.

This is all there is to the adjustment for up and down motion of the steering shaft and also for some of the play in the gears. If the play is excessive and if the car has a tendency to run over

Conducted by Roy E. Berg
Motor Age Technical Staff

THIS department is conducted to assist dealers, service stations, garagemen and their mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Motor Age reserves the right to answer the query by personal letter or through these columns.

the road, it is probable the steering arm on the squared shaft, shown at C, is somewhat loose. Tighten at the locknut D to take up this play. If it cannot be drawn up enough to tighten, then file out a little of the slot and the difficulty will be remedied easily. If there is still play in the entire steering outfit, look for worn bushings on the steering arms.

Overhauling Ford Completely

Q—A 1916 Ford touring car has run 15,000 miles without adjustments. The differential has a hum which is particularly

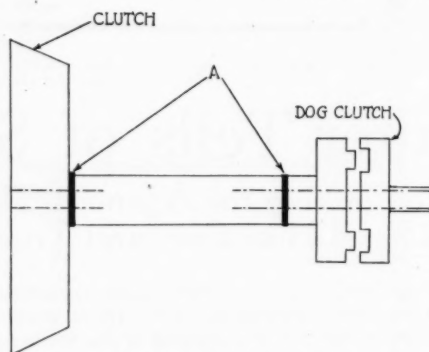


Fig. 2—Omission of washers at A will cause trouble

noticeable when on a down grade with the engine just pulling slightly. Give adjustment to counteract the wear.

2—Would a ball or roller thrust bearing be better than the regular Ford differential bearing? How is a new differential thrust bearing installed?

3—Should a new crankshaft thrust bearing be installed, or is it adjustable?

4—Can oversize pistons be installed, and is it advisable?

5—Would they require lapping in? Give method of lapping in.

6—Would the camshaft bearings need renewing? How is this done?

7—Instruct how to take up play in the rear axleshaft? Would new bearings be sufficient or should the shaft be renewed also?

8—Give working outline for overhauling car.—V. Lewis Phipps, Bruceville, Ind.

1—No car should be driven 15,000 miles without adjustment. To make up for the wear on the thrust washers calls for shimming with thin washers or replacement with entirely new thrust washers. It will be necessary to remove the rear axle and open the case, thus exposing the differential.

The center of the casing should be placed over a pail or box to support it and at the same time permit access to the parts, while the outer end may be supported by a box or block. Having opened the case, it will readily be seen how the thrust washers come out and how they should be replaced. If the old washers are to be used, then it will be necessary to take up the wear by placing back of the outside washer thin washers of some sort to shove the original thrust washers closer to the differential. By referring to Fig. 1, the location of the thrust washers may be seen, being shown at A.

Readjusting Pinions

The pinion will also have to be readjusted, for it is safe to believe the thrust here is also worn. This is shown at B. In case this needs replacement the cotter pin at the end of the pinion must be removed, the nut back of it taken off and the pinion driven off, which will permit the shaft to be withdrawn. Then thin washers may be placed back of the ball thrust collar at B. It would be well to let the pinion C go into the ring gear D perhaps 0.003 in., so when the drive comes it will work back a little and the heels of the gears will come into line.

2—A ball thrust bearing will be far better than the steel-bronze-steel thrust used in the Ford, as the wear will be lessened and friction saved. Several such bearings are made especially to fit the Ford, and all that would be necessary would be to dismantle the rear axle, remove the old thrust washers and

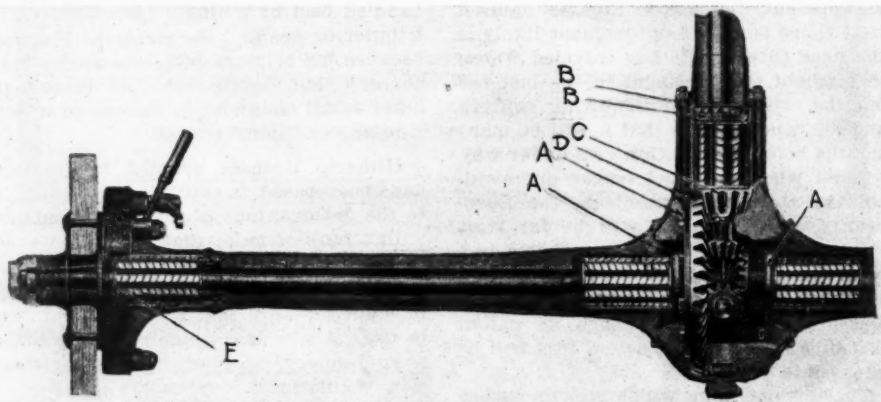


Fig. 1—Rear axle of Ford car, showing adjustments

insert the new ball thrust. Look in the advertising columns for something of the sort.

3—There is no thrust on the crankshaft, the bearings taking care of this in a Ford and in many other cars. This trouble generally is remedied by putting in a new main bearing at the back end of the crankshaft. But it is hardly likely this is necessary, although it will be if there is sufficient wear to permit too great a distance between the coils and the magnets on the flywheel magneto.

4—It is possible and advisable, provided there is considerable piston slap, which there should not be in that amount of running. But it will do little good to install new pistons and rings unless the cylinders are reground so each is perfectly true and all of an exact size. Then this calls for oversize pistons and also new rings. If the cylinders are practically true and still there is a slap, then it would be possible to turn oversize pistons down to fit within 0.001 and then lap them in until you have about 0.002 or 0.0025 clearance. How to lap in a piston was treated exhaustively in *MOTOR AGE* Feb. 13, 1919.

6—It is impossible to tell whether the camshaft bushings would need replacing without an inspection. If necessary the engine will have to come out, the camshaft gear be removed, the camshaft taken out and the new bushings put on. The new bushings will have to be reamed out to fit the wear on the camshaft. In replacing the camshaft be sure the gear is set properly with the gear on the crankshaft. Marks will be found on each and the gears should be meshed where these marks come.

7—While the axleshaft may need replacement, it is not likely or probable new bearings are needed, for they should wear for years. If it is found they are needed, it will be an opportune time to do the work when the axle is out. After taking the wheels off by removing the hub cap and drawing the wheel, the axle housing cap E should be removed, and then the axle and bearing can be removed and replaced.

8—Overhauling a car requires more than a working outline if to be satisfactory. It depends upon the condition of the car to determine how far to go and what to do. By the time you have gone over the rear axle, as probably you will decide to do, you will have that part completely finished and then all that will be necessary will be to tackle the engine and transmission. If you have decided to put in new pistons and new bushings for the camshaft, much of the work will have been accomplished, but it will be necessary to grind the valves, readjust the tappets, clean out the carbon, adjust the main and connecting rod bearings and renew the hose. Naturally every nut and bolt will be inspected, cleaned and tightened.

Likewise the transmission will require inspection, a cleaning and probably new bands on the various drums. The best way to know how to do this sort of work is to be a careful observer when dis-

TO assist readers in obtaining as a unit all information on a certain subject *MOTOR AGE* segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

MISCELLANEOUS

Llyod Leefers, Carlinville Garage.....
..... Carlinville, Ill.
S. W. Sutton.....Terre Haute, Ind.
V. Lewis Phipps.....Bruceville, Ind.
H. Temple Deamon.....Columbus, Ohio
Frank F. Prisbyl.....Bison, Okla.
Edwin Brandvold.....Poplar, Mont.
W. S. Robinson, Minneapolis Steel &
Machinery Co.....Minneapolis, Minn.
Douglas Patterson.....Kenosha, Wis.

ENGINES

Robert R. White.....Gravette, Ark.
F. S. Wilson.....Omaha, Neb.
Douglas Patterson.....Kenosha, Wis.
Clyde George.....Denver, Col.
L. M. Soneder.....Topeka, Kan.
R. W. Mayne.....Globe, Ariz.
Frank M. Allen, Auto & Aeroplane Rac-
ing Co.....Tulsa, Okla.
E. H. Blackly.....Boulder, Col.

LUBRICATION

Robert E. Clawson.....Springfield, Ill.
Ammon H. Kreider.....Lebanon, Pa.

THE ELECTRIC SYSTEM

M. Hayburn, Wisconsin Magneto Co.....
.....Milwaukee, Wis.
A. A. Alexander.....Chicago, Ill.
V. S. Jackson.....Holliday's Cave, W. Va.
Walter L. Cuppy.....Lafayette, Ind.

REBUILDING

W. W. Griden, Reliable Auto Repair Co.
.....Mexico, Mo.
Alphonse A. Thasby.....Chicago
Arthur Heidemann.....Quincy, Ill.
No communication without the writer's
name and address will be answered in
these columns.

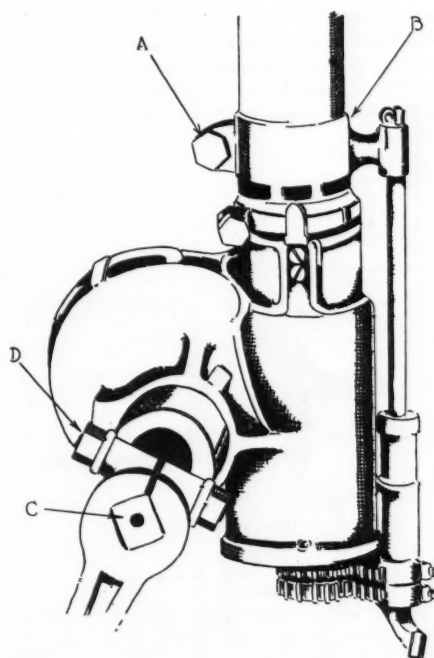


Fig. 3—Steering gear on 1913 Marion, showing adjustments

mantling the car or any of its parts and then to put things together in the reverse order. If possible it would be wise to have some assistance from a man who has had experience with a Ford, and with his help and advice and you doing the bulk of the work the job will be accomplished satisfactorily and cheaply.

Before you have torn the car down take the precaution to clean out the radiator and water circulating system, so this will have been accomplished before the new hose is put on. This is a simple job. Take common washing soda, dissolve a couple of pounds in a pail of water, drain the water from your radiator and engine, add enough water to the solution to fill the system and pour in. Do not let any touch clothes or paint, as it will ruin them. Run the engine a day or two and then draw off the solution and flush with clear water at least twice and all the accumulation of rust and corrosion will have been removed.

Trend Toward Light Car

Q—Does not the light four or six of today equal the performance of large cars of a few years ago? For instance, light fours like Allen, Hupmobile and Essex will throttle down to 5 m.p.h. in high and speed up to about 60 m.p.h. And among the light sixes, Grant, Oldsmobile, Oakland and Cleveland will match the speed and throttle down to 2 m.p.h. on high. Isn't this good? Do the signs point toward the light car as the future type?—H. Temple Deamon, Columbus, Ohio.

Unquestionably, the design of motor cars has improved greatly in the last few years. You speak of four-cylinder cars doing 5 m.p.h. on high gear, which is rather fast when it is considered that many of them will go slower than this. The Essex for instance, and also the Dodge. If the designs being developed in Europe are any criterion then the light car is the car of the future. In Europe the price of gasoline has advanced to ridiculously high figures and in some countries a dollar a gallon is not an uncommon figure. With the price of fuel this high, light cars are made necessary simply because of their economical performances. It is predicted that in a few years distant gasoline will be a thing of memory only and the fuel to be used at that time undoubtedly will cost money, unless some new development in the production of benzol or alcohol is reached.

Soldering Formula

Q—Publish formula for soldering iron, if such can be soldered. There is a small leak in the waterjacket, and we do not care to take it out to have it welded.—Frank F. Prisbyl, Bison, Okla.

This is not a place for solder and there are better ways to make the repair. If the crack were minute, you could close it by applying a solution of sal-ammoniac, which will rust and close the aperture. If it is slightly larger, use litharge, which may be obtained at any drugstore. This will come in powdered form and should be mixed with glycerin until a workable paste has been formed, that is, of such consistency as will permit it to be worked into the crevice with the aid of the finger or thumb.

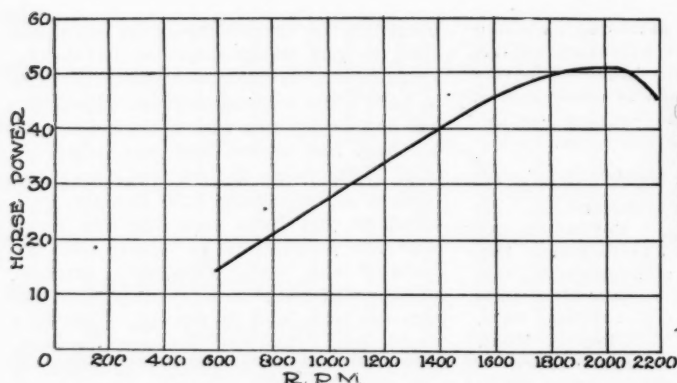


Fig. 4—Power curve of Studebaker EH 6-55 engine

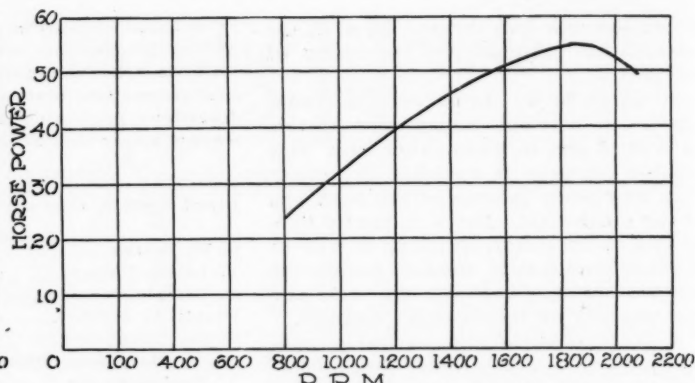


Fig. 5—Power curve of Paige Continental engine

Before this is used run the engine until it is good and warm; then drain the water. The remaining heat will dry the metal. By pressing in the litharge paste and leaving at least 24 hrs., a good repair will have been effected and it will last, too. For safety, however, you can put a plate of metal—brass or something of the nature—over the crack, using small machine screws to hold it in place. The plate should be peened to fit the shape of the waterjacket where the crack is located. Bore holes and tap about $\frac{1}{2}$ in. apart and when the plate is in place—over the litharge paste—a permanent repair will have been effected.

Making a Dodge Fast

Q—What speed could be gained from a Dodge car if it were rebuilt for dirt track racing?

2—What size and make carburetor would you advise for this car for racing?

3—Should a sixteen-valve head be used, or should the valve seats be enlarged and larger valves used?

4—Where can a sixteen-valve head be obtained?

5—Could the old camshaft be used?

6—How much does the starting and lighting system weigh?

7—Would it add to the speed if the heel of the cam were ground off.

8—I expect to install an Atwater Kent system using dry cells and a magneto. Would you recommend this?

9—Could the car be started from the magneto by hand cranking?

10—If larger valves are installed, would the speed and power be improved by installing a different camshaft, or would it be advisable to change the timing of the old camshaft?

11—I intend to rebore the cylinders. How much larger could the bore be made?

12—Should I install aluminite pistons?

13—Should the body be lowered, and how should this be done?

14—What size tires are best for track work?

15—What size or ratio of gears would be best for dirt track work?

16—Would this car be more speedy than a rebuilt Ford?

17—What bore and stroke did the engine in Barney Oldfield's Golden Submarine have?

18—What make was the engine?

19—Was this car a standard make or a special job?—Edwin Brandvold, Poplar, Mont.

1—There are so many things to be taken into consideration in the matter of gaining speed in a rebuilt car that nothing would be accurate except a trial under the most favorable conditions. Off-

hand it is safe to say the speed to be gained could easily go well above 60 m.p.h. Yet, where one man could get 60 m.p.h. another might be able to boost it up another 10 m.p.h., while still another would fall under the 60-mile mark. Anything is possible, and if enough time and money and experimenting and rebuilding were carried through, perhaps close to 100 m.p.h. could be obtained. Building a racing car, keeping it up to top-notch speed or outfitting an old car for racing purposes is an expensive affair when maximum results are to be obtained. If you were familiar with what race drivers have to go through to obtain best results, you would appreciate more fully the meaning of this statement.

2—A carburetor, if $1\frac{1}{4}$ in., would be about all that could be used on a Dodge manifold. As to the make, Motor Age cannot give recommendations. Master, Miller, Rayfield and Stromberg carburetors, however, are largely used in racing, and each has its own points of advantage in some respects. Any good carburetor that will give a sufficient charge of both air and gas and can be properly regulated ought to do the work.

3—A sixteen-valve outfit would give better results, of course, but cannot be obtained. The only sixteen-valve outfit on the market is made for the Ford. So it will be necessary to work on the present valves and enlarge them all they

will stand and to make sure the inside of the inlet manifold is as smooth as possible so the ingoing gas will not be restricted in any way. All sharp corners can be eased off a trifle, the metal can be made smooth and particular attention should be given to seeing that there is none of the gasket at the flange protruding inside to stop the easy flow of the mixture.

4—See No. 3.

5—It would not be advisable to alter the camshaft until you have found this is necessary—that is, when, after all other things have been done, the car is not fast enough. Of course, a specially designed camshaft would be preferable, but this will mean a special job after a lot of careful figuring; even then it might not be just what is wanted and another might have to be made. In making racing engines, it must be remembered, the designers come as near to perfection as possible, and then it generally is found this is about half way. Experimenting in valve sizes, valve opening and closing, compression and a hundred other things determine what is necessary to produce the best results in this matter.

6—Removing the battery, generator, starting motor and all wires would save 100 lb. It is not so much the dead weight that would interfere as would the drag occasioned by the operation of the generator.

7—It must be understood that any change in the shape of the cams will mean an entirely different opening and closing. We believe you will get better results by doing a little experimenting in the matter of valve setting; at least it will cost nothing more than a little labor.

8—For strictly racing purposes we would suggest that a high-tension magneto be used. There are several reasons for this and one is that it simplifies the matter of installation and reduces the number of wires, thereby lessening the chance for trouble from this source. No racing man would think of bothering with such a thing as a starter; it would complicate the assembly and add weight. There is no necessity for two ignition systems inasmuch as they cannot well be timed together and besides there is usually little trouble from ignition unless it is with plugs.

9—Yes, without material trouble. Many

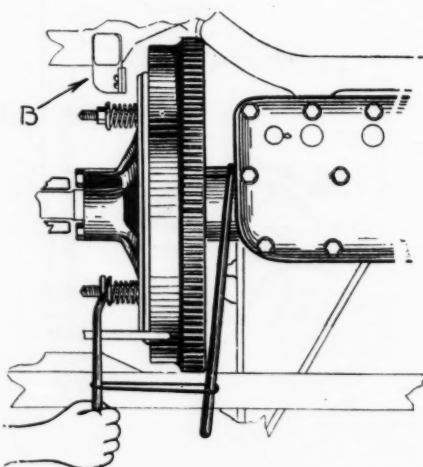


Fig. 6—B may not come into engagement with the clutch cone here

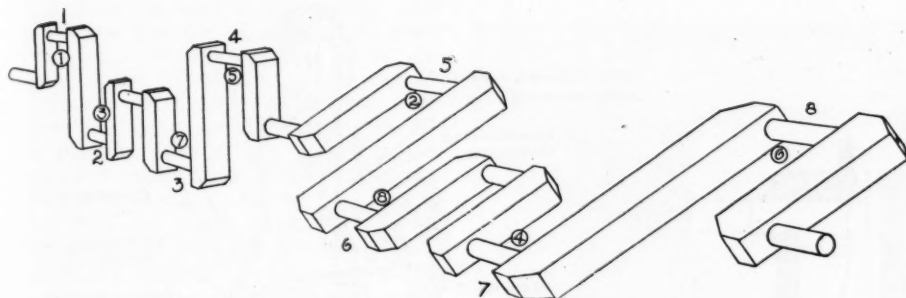


Fig. 7—Crankshaft used on Duesenberg eight-cylinder racing engine

cars equipped with only a high-tension magneto are capable of starting with a quarter turn of the starting crank.

10—Try changing the setting of the old camshaft before attempting to change the design; you probably will have all the speed the car can stand on a dirt track.

11—Do not attempt to take off more than just enough to make the cylinder walls perfectly true. The amount that could be taken off with safety would amount to so little it would not pay to take the chance of ruining the whole block. You might be able to take off 1/32 in., which would increase the bore 1/16 in., but this would be very little in the way of increased volume, as it would add about 7 cu. in. capacity to the cylinder. If you could take off 1/16 in., then it would add about 14 cu. in., in round numbers.

12—Yes; something of the kind, for they will be lighter and produce a snappier engine and one that can be turned up faster.

13—Remove the body entirely and build in a couple of bucket seats, which can be made or secured from motor car supply houses. You will have to make a frame of wood to fit the frame of the car and to this can be attached the bucket back of the seats and this should be arranged with a partition, so 5 gal. oil can be carried in the smaller section. Both the gasoline tank and the oil tank should be fitted with pressure pump, so a supply of fuel and oil will be available at all times. A racing engine must have ample oil, and fuel is called for in larger quantities than in the case of a touring car. The hand pressure pump must be located conveniently to the mechanic. Ahead of the driver should be a deep cowl as a protection against the wind. Furthermore the steering post must be lowered so the wheel will be convenient to the driver in his lowered position. This is easily accomplished by securing it to the dash in a way similar to its present fastening.

14—Not over 32 by 4 in. for the Dodge, and wire wheels ought to be used, as they are lighter and more easily changed.

15—Again this calls for experimenting, but it would be desirable to have at least two sets, one a trifle higher than the other. In a long race the higher set can be used, while for short races the lower gear ratio will be desired. Try a 3 to 1 set and work from that. This is about all the engine can stand.

16—Some Ford cars have shown around 80 m.p.h., but it depends again upon the amount of work in each case. The sizes of the engines are similar, but probably the Ford can be stripped down to be considerably lighter than a Dodge.

17—Barney Oldfield's car has an engine with 3½-in. bore and 7-in. stroke.

18—Miller, made by Harry Miller of Los Angeles, Cal.

19—It was special all the way through.

Gears Clash on Overland

Q—What causes the clashing, or rather banging, in the transmission of an Overland 83, when shifting gears, especially

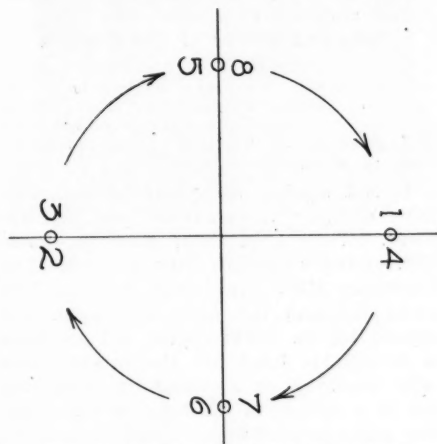


Fig. 8—Probable timing of Duesenberg engine

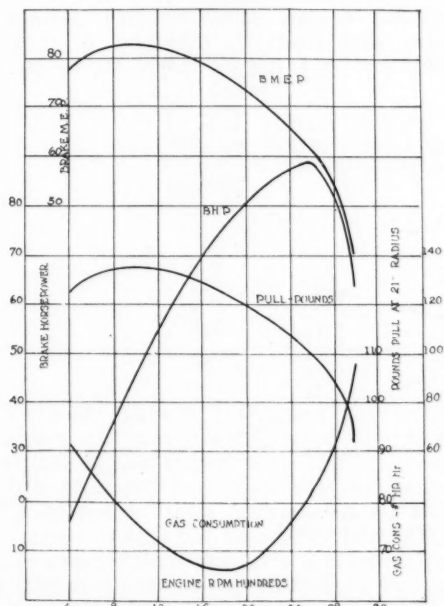


Fig. 9—Horsepower and torque curves of the Packard for 1919

when shifting from second to third speed? This car has run 19,000 miles and when the grease was changed last time the teeth on the gears did not appear worn, nor was there any grit in the old grease. The clutch is worn some but do not believe this would account for the trouble. In shifting from second to third, unless time is taken for the clutch to slow down to just the right speed, when the jaws in the transmission meet, they go together with a loud bang, which cannot help but do damage.—W. S. Robinson, Minneapolis Steel and Machinery Co., Minneapolis, Minn.

Because the leather on the clutch cone has become worn the lateral motion of the clutch is not fully taken up when the clutch pedal is depressed. The result of this is that the small brake, Fig. 6, B does not come into engagement with the back surface of the clutch cone. By adjusting the clutch cone withdrawing yoke so that contact is withdrawn the revolving of the cone will stop when the gears are to be shifted.

Speed of Ford Speedster

Q—Give suggestions for increasing speed of Ford speedster.—Douglas Patterson, Kenosha, Wis.

In MOTOR AGE of June 20, 1918, two correspondents tell how they rebuilt Ford cars into speedsters, and this included about all that could be covered on the subject, including illustrations. In one case a Roof sixteen-valve head was used, Bosch magneto, 1¼-in. Master carbureter, high-speed camshaft, Lynite pistons, water circulator, irreversible steering gear, 18-in. steering wheel, 3 to 1 differential gears, 18-gal. gasoline tank, 3-gal. oil tank in the cowl, with hand force pump to the timing gears, special radiator and racing body. Of course, every part of the engine was gone over and carefully fitted and adjusted.

In the other case the car was underslung some 5 in., the frame was bent at the rear and spliced to make a 100-in. wheelbase. The gear ratio was 2¾ to 1, and the car made 60 m.p.h. In this case a Miller carbureter was installed. It is all a question of how much money and how much time you care to expend.

Power Curve of Studebaker

Q—Publish power curve of the Studebaker EH 6-55 engine.

2—Publish power curve of the Paige Continental engine.

3—Publish power curve of the Buick H engine.—Robert R. White, Gravette, Ark.

1—The Studebaker EH power curve is shown in Fig. 4.

2—The Paige 6-55 power curve is shown in Fig. 5.

3—The Buick power curve was shown in last week's issue.

Timing of Duesenberg

Q—Instruct how to time the valves on an eight-cylinder Duesenberg engine.

2—Publish cut of crankshaft.

3—What is the firing order?

4—Publish cut of valve timing to get the most revolutions per minute.—F. S. Wilson, Omaha, Neb.

1—We are unable to give the timing diagram for this Duesenberg engine. The maker is very secretive about this matter and talks about such things only to his chief designer.

2—The crankshaft is illustrated in Fig. 7. It will be noticed that the shaft is

merely two four-cylinder shafts placed together with an angle of 90 deg. between the two shafts.

3—The firing order we have reason to believe is 1-5-2-7-4-8-3-6.

4—We suppose that the timing as used gives about the fastest speed of the engine. As we said before, the exact timing of this engine is not known. However, the following timing gives a very close approximation to the correct setting of the valves: Exhaust valve opens 46 deg. before bottom center and closes 8 deg. after top center. The intake valve opens 4 deg. after top center and closes 42 deg. after bottom center.

Ignition on Ford Speedster

Q—A Ford speedster has a large Stromberg carburetor which has no needle valve. Instruct how to adjust same.

2—Would an Atwater Kent ignition system be as good for speed as a Bosch magneto?—Douglas Patterson, Kenosha, Wis.

1—The Stromberg concern makes a good many different models of carburetors, and without knowing the model no accurate directions for adjustment could be given. The carburetor is marked with a letter or combination of letter and number, and if you will send this to MOTOR AGE, the method of adjustment will be given.

2—No, although it would be better than the coil system.

Fiber Timing Gears

Q—Would a fiber or fiberoid camshaft gear give better results than bronze in a 35 J. 1914 Mercer special engine?

2—Is it advisable to put in say, two ¼-in. bronze plates riveted on each side of fiber, such as used on motor pinions, and rawhide gears or rivet the fiber direct to the metal hub and cut the teeth, giving them no metal support?

3—Where can they be purchased?—Clyde George, Denver, Colo.

1—Fiber gears when properly made will give good service and have been much used by foreign makers. They will not, however, serve better than the bronze gears, although they will perhaps not emit so much noise after a certain amount of wear has taken place. If the bronze gears are made properly and lined up carefully, they never will make

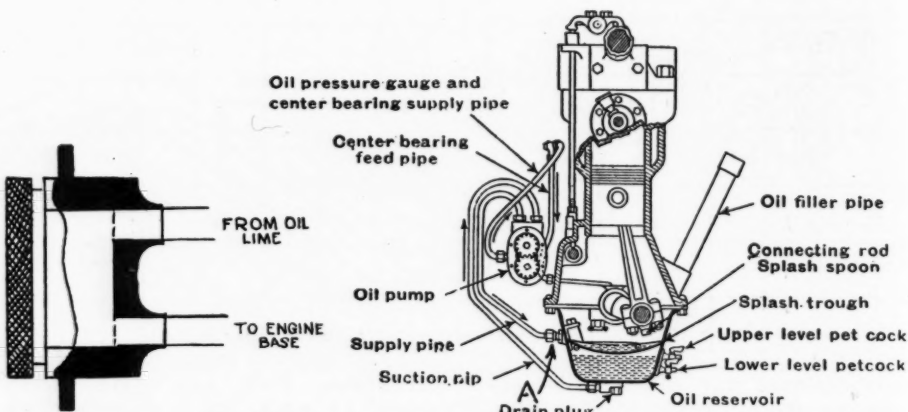


Fig. 11—Lubrication system used on 1919 Chevrolet 490

enough noise to annoy you and they may be depended upon to give service.

2—If they are to be used, the better method would be to sandwich the fiber between the bronze plates, as suggested, and they should be pressed in addition. You still will have ½ in. of bronze to contend with, and so where will the gain come in?

3—Some Denver supply house can obtain them for you, or consult the advertising columns of MOTOR AGE.

Bore and Stroke of Old Engines

Q—What was the bore and stroke of the following engines, and did they have detachable heads? Chalmers 30, 1910, White 30, Lozier 4, also the 1915 Farmack and the smallest Jackson 8.—L. M. Soneder, Topeka, Kan.

1—Not stating the years of manufacture compels a somewhat lengthy answer, for most of these concerns made four-cylinder engines from 1918 on. The Chalmers M30K was made in 1910, 1911 and 1912 and the bore was 4 in. and stroke 4½ in. This engine did not have a detachable head but the intake valve was within a cage, which in turn was set in a pocket in the head of the cylinder and operated by a rocker arm, while the exhaust was operated by a pushrod from the camshaft, as in the case of an L-head engine. Four-cylinder engines also were made by Chalmers in 1912, 1913 and 1914, the size being 4¼ by 5¼.

In 1909, 1910 and 1911 the 40 had a 5 by 4¼ engine, and in 1909 there was also an engine 3 7/7 by 4½ in.

The Jackson built only one size of eight-cylinder car, this being 3 by 3¼ in., and this is the size for 1916, 1917 and 1918.

The Farmack was afterward known as the Drexel and had an overhead camshaft and consequently a detachable head. The cylinder size was 3½ by 5 in.

In 1911 to 1915 the White engine was 3¼ by 5½ in.; also from 1911 to 1914 there was a 4½ by 5¼ size; in 1915 the dimensions were 4¼ by 6¾ in.; in 1917 4¼ by 5¾ and after that the sixteen-valve job ran 4¼ by 5¾ in. None of the old models had detachable heads.

Lozier was a consistent builder of fours. Prior to 1914 the engines were T-head, while those after that time were detachable. The sizes were many, so far as cylinder dimensions were concerned, so that little information can be gained unless you know the exact model. The sizes ran as follows: In 1908, 5¾ by 6, 4¾ by 5½ and 5¼ by 5½ in.; 1909, 5¼ by 5¼ in.; 1910, 5¾ by 5¼ in.; 1911, 5¾ by 6 in.; 1912, 4¾ by 6 in.; 1914-15, 4¼ by 6½ in.; 1916-17-18, 4¼ by 6¾ in.; 1918,

Setting Dodge Valve Tappets

Q—All of the valves on a 1917 Dodge were ground three weeks ago. In the exhaust of No. 4 cylinder the valve was badly burnt. It looked as if the valve had become stuck but everything was clear. The same thing has happened again. A new valve in the exhaust of No. 4 is badly burnt. The car has gone about 750 miles. What is the cause, and give the remedy? The car often is run at a speed of 35 or 40 m.p.h. Could this affect a valve so soon?—R. W. Mayne, Globe, Ariz.

Only one thing seems possible in this case—an uneven valve tappet end or valve stem end, which permits the valve to hold open slightly and receive the

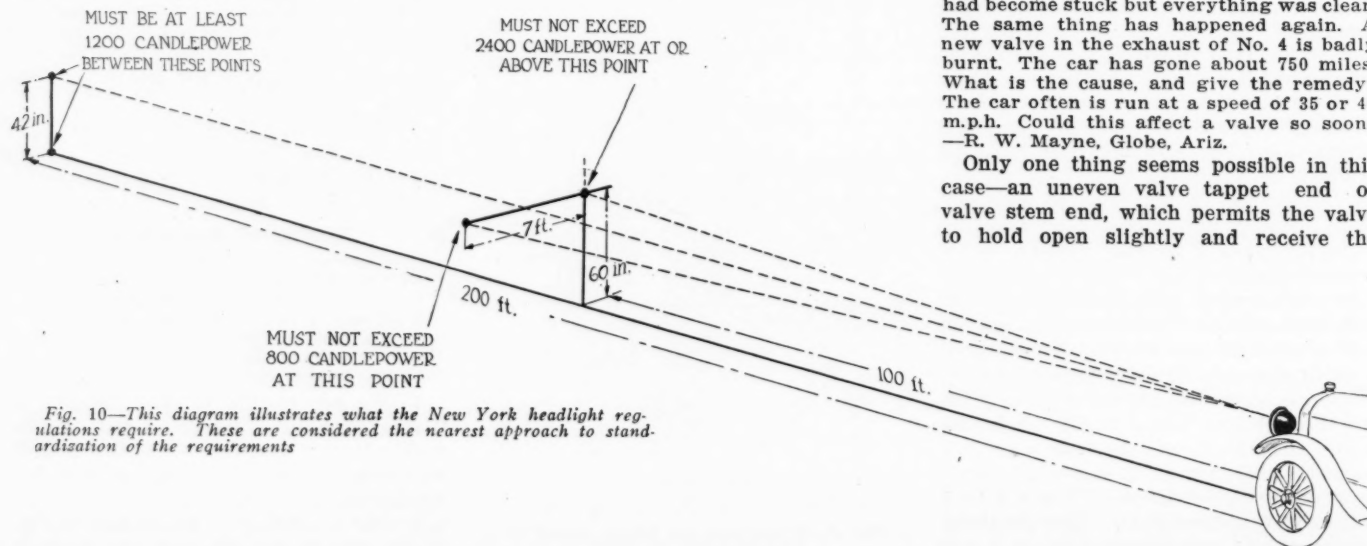


Fig. 10—This diagram illustrates what the New York headlight regulations require. These are considered the nearest approach to standardization of the requirements

flame more or less at all times. The quality and quantity of the mixture must be the same in one cylinder as in another. If the top of the valve tappet or the bottom of the stem is not even, an adjustment may have been made with the low part in engagement, so when the high spot comes into action the valve does not close fully. It may also be the valve does not rotate, as it would do to some extent if perfectly free.

Have the ends of the valves and also the tappets ground off exactly square and then allow about 0.003 clearance for expansion of the stems and tappets. Do not forget that a better working engine will result by having a little too much valve clearance than too close a fit, which will hold the valve from entirely closing when the engine becomes hot. If you are in the habit of running the car 35 or 40 m.p.h. to any extent, we would suggest you set the tappets so when the engine is good and hot, after an hour's run, there would still be clearance. This will make a little more noise from the tappets, but it will at the same time make a better running engine.

Valve Timing for 3500 R.P.M.

Q—Publish best valve timing for an engine with $3\frac{1}{2}$ -in. bore and 5-in. stroke light rods, aluminite pistons, valves, 2 1/8-in., six cylinders and balanced crankshaft. We desire the engine to turn over 3500 r.p.m.—Frank M. Allen, Auto & Aeroplane Racing Co., Tulsa, Okla.

We do not say the valve timing given in the following is the best but it will permit of about the maximum ability from the engine. Design your camshaft and set it so the intake valve opens 7 deg. after top center and closes 42 deg. after bottom dead center. The exhaust valve should open 5 deg. before bottom dead center and close 8 deg. after top center. Measured in inches this timing is expressed as the intake opening when the piston has moved 1/64 in. on its downward stroke and closing when the piston has moved 17/32 in. upward on its compression stroke. The exhaust will open 57/64 in. before the piston has reached bottom center and will close 1/32 in. after the piston leaves top center.

This timing, while it will permit of high speed, will not allow the engine to develop 3500 r.p.m., and frankly we believe no timing will permit of this speed unless the engine is designed for the speed.

Knight Engines a Success?

Q—What faults or disadvantages have the Knight-valve engine that it is not more generally in use? Is there ever any trouble caused in any way by the sleeves, pistons or any part of the engine becoming too hot due to the difficulty of the intense heat escaping to the water through the sleeves and the films of oil between them, the oil being an exceedingly poor conductor of heat? Is the Knight sleeve-valve engine a thorough success?

2—What economy of fuel does the steam motor car show?

3—Why is it not more generally in use?—E. H. Blackly, Boulder, Col.

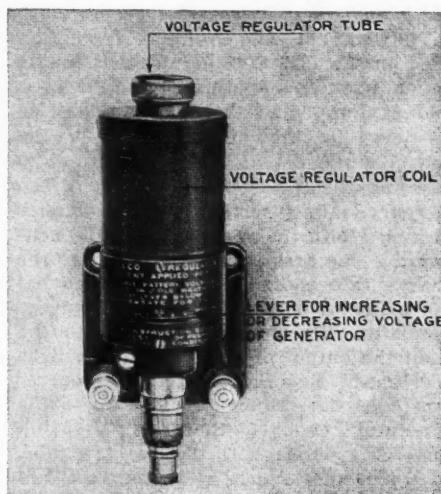


Fig. 12—This shows the lever for increasing or decreasing the voltage of the 1913 Cadillac

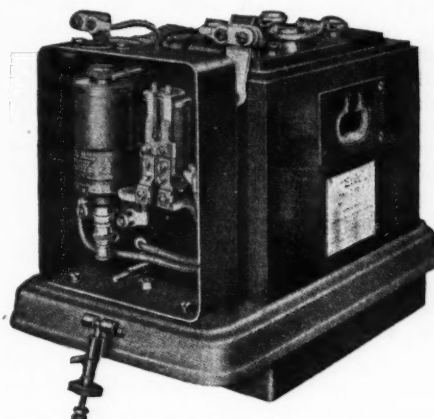


Fig. 13—Exterior view of the Delco mercury regulator

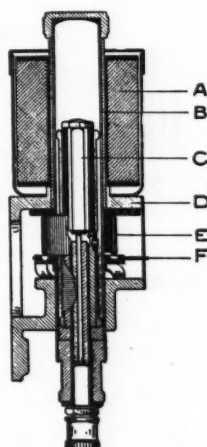


Fig. 14—Cross-section of Delco mercury regulator

1—We judge by the nature of your inquiry that it is your desire to know why, if the Knight engine is all that the makers claim for it in their advertisements, it is not in more universal use. The answer is that the expense of the engine is greater than that of a like-sized engine of poppet-valve construction. Prominent automotive engineers said when the first Knight engines were introduced that

the principle of the Knight engine was very poor because heat transference through three oil films was too great a disadvantage for a thorough cooling system. They cited the experimental case where heat radiation of steam radiators reduced 80 per cent because an oil film was allowed to collect on the inside surface of the radiator.

While the facts in this case cannot be denied, it seems rather a poor criticism at best. Performance is the only basis for making a reasonable comparison. If an engine performs the duties that it has been designed for, and does so economically and efficiently, what more can one ask? For ordinary touring car and taxicab work, the Knight engine has stood up under the most severe service.

2—Gallon for gallon and car weight for car weight, the steam car at ordinary touring speeds is just as economical as the gas car, but since the steam car uses kerosene instead of gasoline for its fuel, and because kerosene costs about one-half as much as gasoline, the operating cost is reduced accordingly.

3—The cost of the steam car is perhaps the biggest limiting factor in its general use. If a steam car was produced whose cost would be in the neighborhood of \$1,200 to \$1,500 and whose operating simplicity was equal to that of the higher-priced steam cars, there is very little doubt but what these cars would be almost as popular as the Buick or some other car of equal fame.

Power Curve of Packard

Q—What road speed does a Dodge Brothers car have at 1000 r.p.m.?

2—What road speed does a 1919 Packard have at 1000 r.p.m.?

3—Publish chart giving fuel consumption, torque and horsepower curve of the Packard Twin-Six engine, 1919 model.—Ammon H. Kreider, Lebanon, Pa.

1—At 1000 r.p.m. the Dodge car makes a road speed of 23 m.p.h.

2—The Packard car makes a road speed of 23.5 m.p.h. at 1000 r.p.m. engine speed.

3—See Fig. 9.

Lubrication

Sight-Feed Oiler

Q—Publish diagram showing how to connect a sight-feed oiler to 1916 Chevrolet 490.—Robert E. Clawson, Springfield, Ill.

A sight gage can be secured from any gage maker and should be secured to the dash of the car. The piping system on the Chevrolet engine is shown in Fig. 11. The pipe from the oil pump should be disconnected at the engine and an extension run to the top connection of the gage. From the lower connection of the gage a pipe should be run to the engine oil lead connection. With an arrangement of this kind all the oil pumped to the engine will pass through the sight dash indicator. Care should be taken to see that the pipes are tightened or else leaks will develop and the oil consumption without apparent reason will be excessively high.

The Electric System

Standard Headlight Regulations

Q—Publish standard regulations for headlight requirements.—M. Hayburn, Wisconsin Magneto Co., Milwaukee, Wis.

In general the laws of the various states merely state that it is necessary for a vehicle to have a light, and for motor cars that the light be of sufficient power to illuminate objects satisfactorily at a distance of 200 to 250 ft. In New York, the greatest strides have been made for the standardization of headlights. In brief the requirements of the New York law, which are the most complete of all laws, are:

1—The candlepower must be at least 1200 at a distance of 200 ft. in front of the car and at a point between the roadway and at 42 in. above it.

2—The candlepower must not exceed 2400 at a distance of 100 ft. in front of the car and at a point 60 in. or any higher above the road.

3—The candlepower must not exceed 800 at a distance of 100 ft. in front of the car at a point of 60 in. above the road, when measured 7 ft. to the left of the center of the car. The illustration in Fig. 10 shows the application of these requirements.

Regulations as contained in all the state laws have been published in *MOTOR AGE* from time to time and no doubt will be published again, but it is impracticable to give a complete digest here.

Cadillac Mercury Regulator

Q—Instruct how to cut down amperage on a 1913 Cadillac. It now charges about

30 amp. at 25 m.p.h.—V. S. Jackson, Holli-day's Cave, W. Va.

The current and voltage regulation used on the 1913 Cadillac depends for its action upon the floating of a tube in a mercury well. As the float is raised in its level by the lifting action of the solenoid, the resistance wire secured to the end of the float is raised out of the mercury, thus inserting more resistance in series with the shunt field of the generator. The first attempt at lowering the charge rate should be made by moving the indicator on the front of the voltage regulator. By moving this lever to the right the output of the generator will be decreased. See Fig. 12. If this operation does not reduce the voltage of the generator enough, there is probably something wrong with the mercury tube. It seems very much as though the full force of the generator is being impressed upon the battery without any regulation of any kind.

If the indicator does not reduce the charge rate enough, remove the cap on the voltage regulator and observe the float in the well. Does this rise and fall when the float is depressed with a small bent wire? If not there is something wrong with the mercury level or else the plunger has become stuck to the walls of the cylinder through the loss of the oil which covers the surface of the mercury.

When the engine is speeded up the float should rise, because the height of the float is proportional to the voltage of the generator and, consequently, its

speed. It is also possible that the solenoid coil in Fig. 14 has become disconnected

Using Benzol as Fuel

Q—What is your opinion as to the advisability of the use of benzol as a fuel for a motor car engine. We are aware it is being used by several large corporations with great success. Could these same results be obtained by anyone?

2—Can it leave any permanent injury to the engine if tried? I have been informed that it leaves deposits on the valve seatings. How would it affect a six-cylinder Buick and a twelve-cylinder Packard engine?—A. A. Alexander, Chicago.

1—Benzol as a motor fuel is just as good as gasoline and if compared according to heat units per pound of fuel is a little bit better than gasoline. Benzol when used in an internal combustion engine requires more air than gasoline for its complete combustion, because of the higher carbon content. If sufficient air is not mixed with benzol, a heavy, sooty deposit of carbon will be formed in the engine. As long as the air mixture is proper, anyone can secure good results with benzol as an engine fuel.

2—This putting which you speak of undoubtedly is caused by an improper setting of the carbureter. The air valve, when benzol is used, should be opened to its maximum position. maximum. Some so-called benzols have not been sufficiently purified and the excess sulphur content may cause pitting. Too much sulphur in gasoline would cause pitting, for that matter.

Buick Knocks Though Overhauled

Q—A 1914 Buick B-25 has a knock in the engine that we have been unable to find. When the engine is started cold, climbing a hill no knock occurs but as soon as the engine becomes warm when on a hill the knock becomes very loud. When it is crowded a little too much in starting or for instance after turning a corner the same knock occurs. The engine has been completely overhauled, main bearings and connecting rods tightened, piston rings are not loose enough to cause knock. The timing has been checked by two experts, who say it is O. K. Retarding or advancing the spark has no effect on the knock. We are advised to raise the cylinders about 1/16 in. to reduce compression pressure.—Walter L. Cuppy, Lafayette, Ind.

You have, by implication, upset two theories we might have advanced. It sounds at a distance of 137 miles like a case of preignition, due to the presence of carbon, or looseness in one or more of the engine bolts. Yet if the engine has been overhauled, it is safe to assume there is no carbon and also that the engine is firmly held to the frame. If not—and it is possible—the mechanic has slipped somewhere.

When carbon is present in rather large quantity there will be no knock when first started; not until the carbon has come to a glow; then it will make its presence felt, particularly on a pull, as in going up a grade. This symptom develops also when the throttle is opened after rounding a turn. It seems very much like carbon, despite the fact the engine was supposed to have been overhauled.

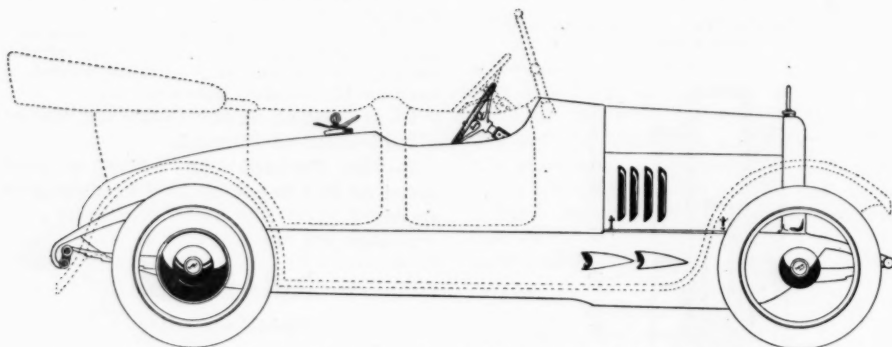


Fig. 15—Suggestion for converting 1918 Willys-Knight into speedster

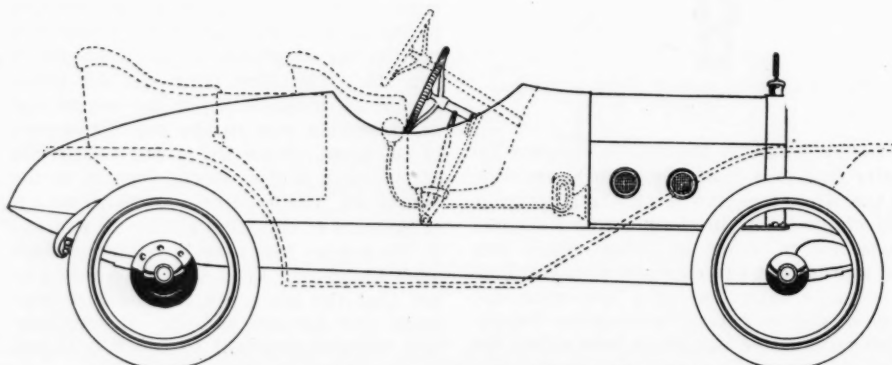


Fig. 16—Suggestion for converting 1909 Cadillac into speedster

If it were a loose engine, then the knock would manifest itself on a hill quite as much when cold as when it had warmed up, so possibly this cannot be the case. Yet if it were not for this, we would suggest you look for the trouble here.

There is not one chance in a hundred that the compression has increased; if anything, it will have decreased in six seasons of use. Before trying to raise the cylinders, which involves considerable work, put a compression gage on each cylinder and know what the compression is. Unless this trouble has always existed, the theory that it is too much compression is dispelled.

There is still the possibility that the ignition timing is incorrect, despite the fact that working the lever does not change matters. Check this up yourself. Bring the piston of No. 1 cylinder to the top center, on the compression stroke, and while the spark lever is fully retarded. The spark should occur at this point and if it does, you will know the ignition is correct. If this does not bring a remedy then look for carbon or for a loose engine bolt.

Rebuilding

Old Speedster Not Advised

Q—Publish speedster design for a 1918 Willys-Knight touring car.

2—Publish speedster design for a 1909 Cadillac touring car.

3—What changes will be necessary in the Willys-Knight to obtain a speed of 90 m.p.h. and still have a car that will be quick on the pickup and getaway and work well on a ½-mile track?

4—What is the approximate cost?

5—Does a generator offer any resistance to an engine at speed? If so, how much?

6—Is it advisable to have a self-starter?

7—What ignition and carburetor would you advise for high and low-speed work combined?

8—Can the ports in the sleeves be enlarged to any advantage of cooling and requiring more speed?—W. W. Griden, Reliable Auto Repair Co., Mexico, Mo.

1—A design for a speedster using a Willys-Knight chassis is shown in Fig. 15.

2—We show this design in Fig. 16, but doubt very much the value of it. A car of 1909 vintage is beyond the reach of the rebuilder for use as material for a speedster.

3—Your requirements and the working material are too conflicting to design a car for 90 m.p.h. In the first place Knight engines are used very little for racing work. Lubrication of the regular stock Knight engine built for touring car use, will be very difficult, and we doubt the feasibility of the idea.

Besides the difficulty of adapting this engine to racing car use, it is your intention to secure a rapid acceleration and at the same time a high rate of speed. The first condition demands that the ratio of the rear axle gears be low, and the second condition demands that the ratio be high. The acceleration with the present gears and transmission is,

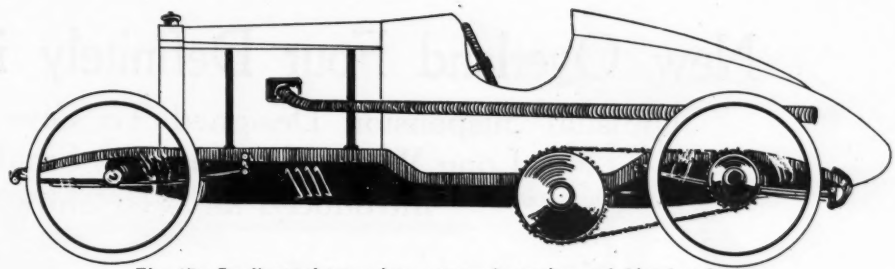


Fig. 17—Small speedster using motorcycle engine and bicycle wheels

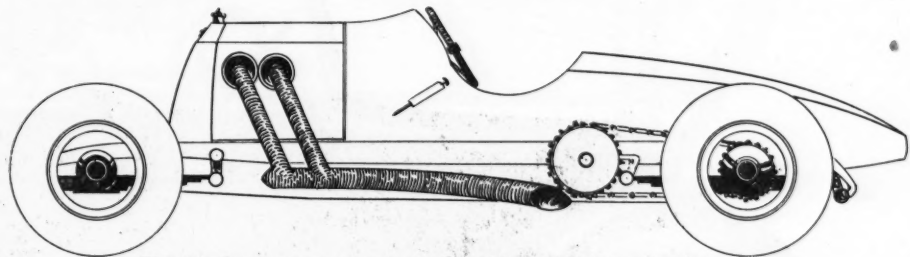


Fig. 18—Small two-passenger speedster with tail and two-cylinder engine

we suppose, about satisfactory. For the speed to be raised to 90 m.p.h. the gears in the rear axle must be changed so the ratio will be 2.5 to 1. The present ratio of these gears is 4.30 to 1. At the maximum engine speed of 2200 r.p.m. and with the stock equipment tires, 34 by 4½ in., this gives a maximum car speed of 53 m.p.h., the present top speed of your car.

While it is true the car can be reworked sufficiently to give this increased speed, the expense will be large. As much as possible should be done toward bettering the engine performance. A two-spark ignition system would add greatly to the car speed, but this cannot be applied very well to your car.

4—The cost of such a rebuilding job will vary greatly, according to how the work is done, that is, if a body builder builds a special body, at least \$600 will be added to the bill right here. You will need to have an oil pump of greater capacity made to insure proper lubrication. Machine work of this nature is done on a basis of \$1.25 per hour. The total cost is going to run in the neighborhood of \$1,000 at least.

5—A generator consumes about 1 hp. This in itself is small, but as the generator is apt to be burned out from the continuous high speed, it should be disconnected. Removing the brushes will protect the generator, if it is desired not to remove the generator entirely.

6—If the generator is to be removed, then the self-starter should not be used, for it is ruinous to the battery to use the starter without a generator to replenish the current taken by the starting motor.

7—There is very little choice between the different types of ignition systems as far as performance is concerned. Magneto ignition is reliable certainly, but battery ignition is applicable to high speeds for multi-cylinder engines without the disadvantage inherent to the magneto, that of high armature speeds. For instance, a magneto produces two sparks per revolution of its armature,

and an eight-cylinder engine requires four sparks per revolution, or the magneto must revolve two times as fast as the engine. This objection, though, now has been overcome by more efficient design.

Carbureters built for touring car work are designed with the one thought of economy in view. For racing, economy is not the important consideration, hence the reason why racing cars do not throttle down very slowly or evenly.

8—We do not advise that the ports of the sleeves be enlarged. This is a task that entails more work than at first seems necessary. The gas ports will have to be changed to meet the new size of the valve port, and this means a larger carburetor and so on. Every change of this order calls for a whole sequence of changes, which must be made in proper proportion.

Small Speedster Design

Q—Publish sketch for speedster similar to de Palma's Packard, using a one-cylinder motorcycle engine. I have four bicycle wheels I desire to use.—Alphonse A. Thasky, Chicago.

This design is shown in Fig. 17.

Speedster With Motorcycle Engine

Q—Publish sketch and give dimensions of a small two-passenger speedster having a tail and using a two-cylinder motorcycle engine and wheels.

2—Which motorcycle engine would you suggest for this purpose?

3—Is it possible for me to build it myself, including the body?—Arthur Heide-mann, Quincy, Ill.

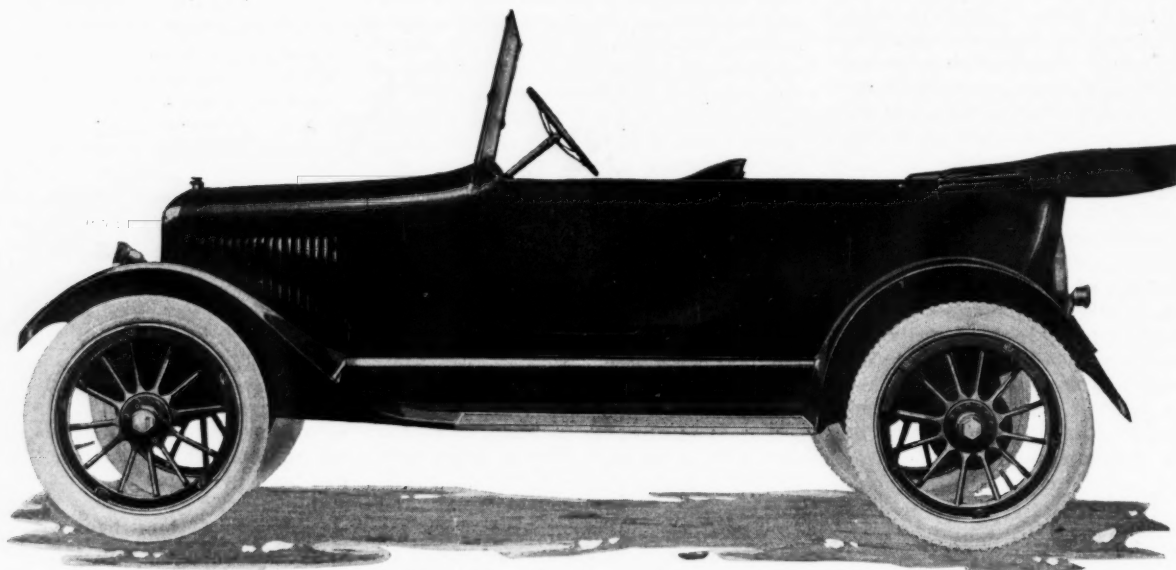
1—This sketch is shown in Fig. 18.

2—There are several two-cylinder engines that may be used in this cyclecar. Any standard motorcycle engine will do. The difference in these engines is not very pronounced, so that there will have to be no changes to accommodate the setting of the engine in the frame.

3—This is a question that only you yourself can answer. If you are inclined mechanically and have access to a small shop, there is no reason why you should not build the car yourself.

New Overland Four Definitely in Production

Unusual Suspension Designed To Give Equivalent of
Long Wheelbase Features Small Car
Introduced at 1918 Shows



New Overland Four in five-passenger style at \$845

THE spring suspension is the only radical feature of the new Overland 4, one of two models to which Willys-Overland will confine its manufacture. The chassis for this car was exhibited first at the New York show in January, 1918, and later at Chicago. While a few refinements have been made since then, the car as a whole, remains the same. The Willys-Knight, of course, will be continued and a six-cylinder job will be made by a separate organization in the east, the Willys Corp.

The spring suspension on the new four is so arranged that the spring supports are 130 in. apart, while the wheelbase is about 100 in. This makes possible a car of less than 2000 lb., but with maximum room in the car and allows the production of a full five-passenger size with complete equipment at \$845, a moderate price, considering the current material situation. On the same chassis there will be a roadster at \$845, a sedan at \$1,355 and a coupe at \$1,225. Production is running about 350 a day, and deliveries are being made as fast as possible.

No Cross Members on Frame

The chassis has been stripped to bed-rock simplicity. There are no cross members on the frame, the rear engine support acting as such. The frame side members are straight and tied together front and rear by heavy end pieces to take care of the stresses imposed by the spring suspension. The chassis suspension is practically three-point. The springs are fastened to the frame at the front end by bolts and to the axle by eye-bolts, the same construction being used for the right rear spring. The left

FEATURES OF NEW OVERLAND FOUR

130-in. springbase with 100-in. wheelbase

Cylinders $3\frac{1}{4}$ by 4, L. head

Autolite electric system

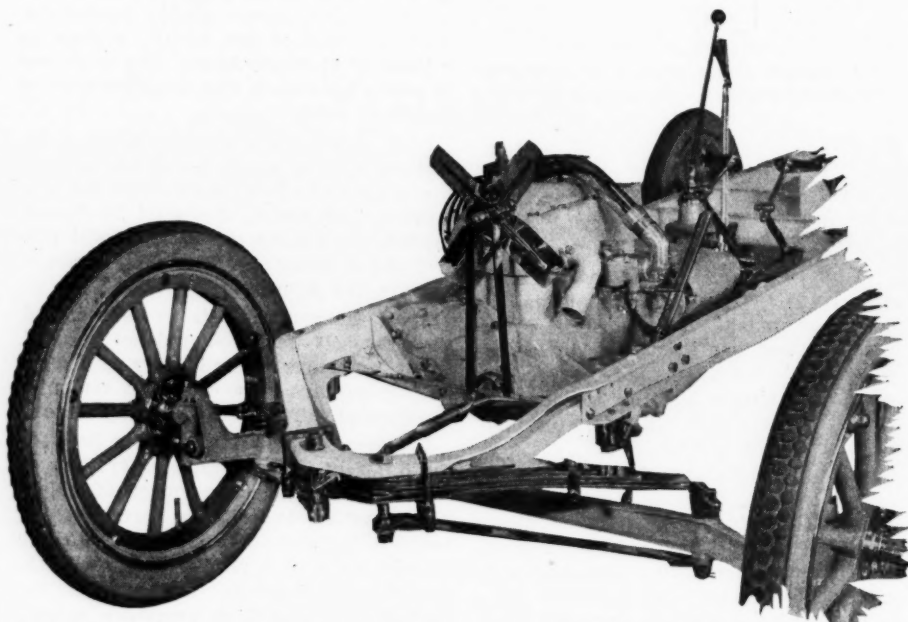
Oil circulated by flywheel

Three-point chassis suspension

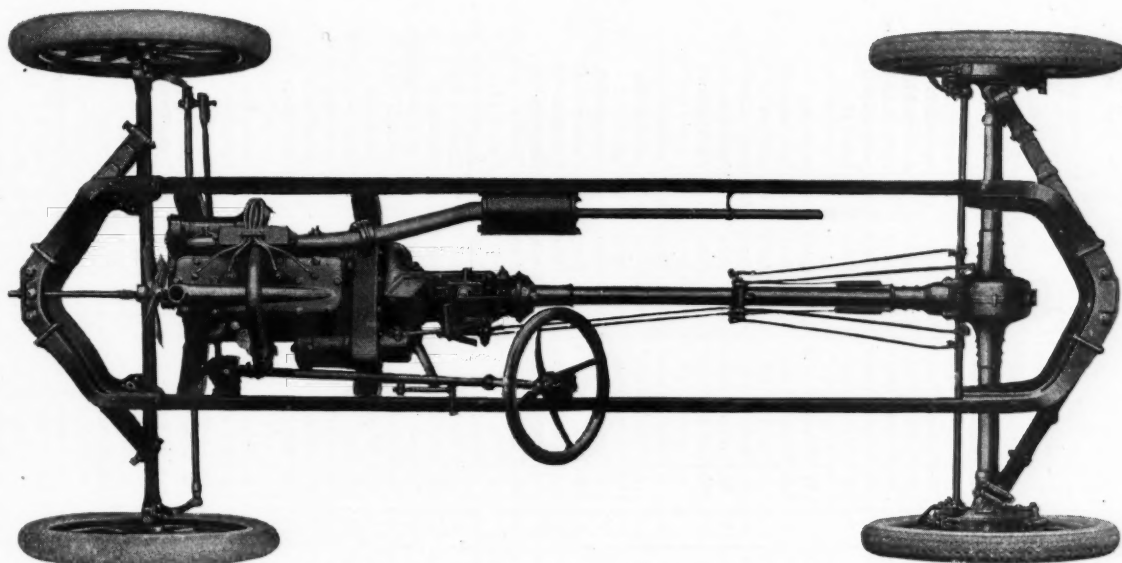
Roadster and five-passenger touring car, \$845

rear spring, however, is bolted to the frame and shackled to the brake support on the rear axle, thus providing the one-shackle construction for which this car is noted. All elongation of spring centers is taken care of by this single shackle. The drive is taken through the springs.

The engine is a conventional $3\frac{1}{4}$ by 4-in. detachable L-head with integrally cast cylinders and crankcase. The aluminum pistons have three ring grooves, two above and one below the piston pin.



Unusual spring suspension which features Overland Four and which is designed to give riding effect of greater wheelbase



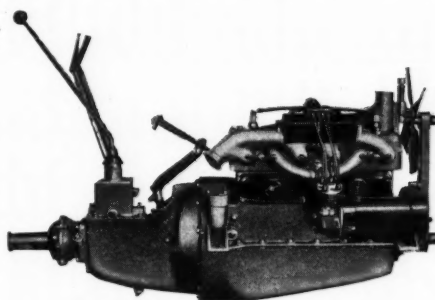
This shows why the manufacturer announces a "130-inch springbase." The springs attach to the frame 15 inches ahead of, and behind, the axles

Precautions have been taken for an ample supply of water through the thermo-syphon system. The jackets are large and the radiator is a cellular type with non-corrosive sheet brass tubes. The radiator shell is a pressed steel one-piece unit, and to assist cooling there is a fan shroud on the radiator.

Capacity of the cooling system is 3 gal. 3 qt. The fan is a four-blade, steel stamping, belt-driven, with an adjustment provided through the fanshaft lock.

Constant circulation of the oil is maintained by the flywheel gear teeth. The oil is picked up from the reservoir and thrown into a strainer, where it is filtered. It then is led to the main feed pipe, which runs the full length of the cylinder block. Three holes connect this feed pipe with the crankshaft bearings. Scoops on the lower ends of the connecting rods splash the oil to the cylinders and other bearings. The timing gears are lubricated through a small

hole in the end of the main oil feed line above the front main bearing. The oil in the crankcase communicates with the



In this engine the oil is circulated by the flywheel gear teeth

clutch, gearset, universal, speedometer gear, generator and starting motor drive end bearings. The capacity of the system is $1\frac{1}{2}$ gal.

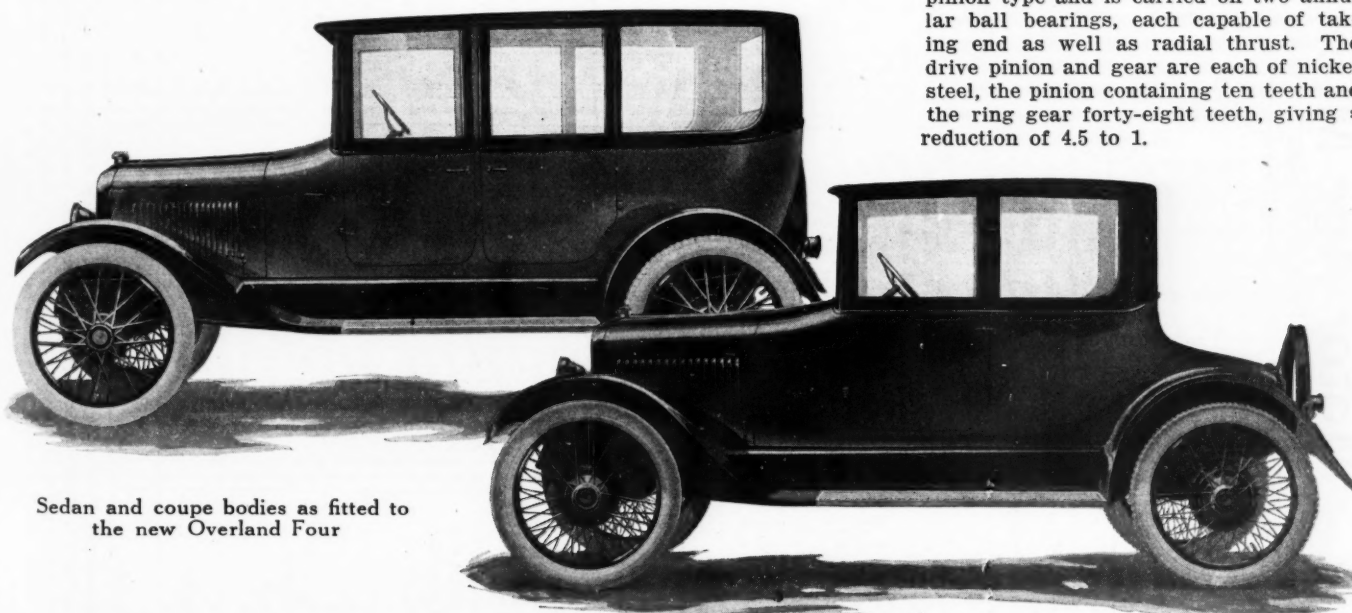
The gasoline tank is under the cowl and provides a gravity feed. The carburetor is a $\frac{3}{4}$ -in. Tillotson, of the type used in previous Willys-Knight cars, equipped with hot-air attachment.

Auto-Lite electrical equipment supplies lighting, starting and ignition. The battery is 6-volt type rated at 80 amp. and located beneath the driver's seat.

The clutch is a single-plate, mounted on a splined shaft and clamped between the flywheel and another iron ring by a spiral spring. Between the flywheel, clutch plate and thrust ring are interposed two molded asbestos plates 8 in. in diameter and $\frac{1}{8}$ in. thick. Pressure is applied to the spring for engagement through three toggle levers by a 300-lb. spiral spring.

Because of the use of a torsion tube, but one universal is necessary.

The three-quarter floating rear axle is carried in a two-part malleable iron housing. The differential is a four-bevel pinion type and is carried on two annular ball bearings, each capable of taking end as well as radial thrust. The drive pinion and gear are each of nickel steel, the pinion containing ten teeth and the ring gear forty-eight teeth, giving a reduction of 4.5 to 1.



Sedan and coupe bodies as fitted to the new Overland Four

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only—These tables are revised and brought up to date monthly

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H. P.	Carburetor Make and Size	Fuel Feed	Clutch	Gearbox	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Allen 43	5	\$1295	110	32x4	Miller	3 1/2 x 5	G. B. & S	4	19.6	1-Stron.	Vacuum	B. and B.	Own	Detroit	Columbia	Ditweiler	Stewart	Firestone	6-8	90	Pres.	A-L	A-L	Conn.	6-8	Allen 43
American B.	5	1765	121	32x4	Firestone	3 1/2 x 5	Ruten.	6	23.44	1-Zen.	Vacuum	B. and B.	G-L	Warner	Salisbury	Gemmer	V. Sicklen	Firestone	6	80	Col.	West.	West.	A-K	6	American B.
American Beauty	5	2000	121	34x4	Firestone	3 1/2 x 4 1/2	Cont.	6	25.35	1 1/2-Ray.	Vacuum	B. and B.	Warner	Arac	Timken	Warner	Warner	Firestone	6	100	Willard	West.	West.	A-K	6	American Beauty
Anderson 8-20	7	2625	120	33x4	Federal	3 1/2 x 4 1/2	Cont.	8	25.35	1-Zen.	Vacuum	B. and B.	Durston	Arac	Col.	Jacob	Stewart	Firestone	6	80	Willard	West.	West.	Conn.	6	Anderson 8-20
Apperson Anniversary	7	4000	130	34x4	optional	3 1/2 x 5	Own	8	25.35	John.	Vacuum	B. and B.	G-L	Sterling	Own	Own	V. Sicklen	Firestone	6	90	Willard	Bijur	Bijur	Conn.	6	Apperson Anniversary
Auburn 6-39-H	5	1695	120	33x4	Goodrich	3 1/2 x 4 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	Own	Hart.	Col.	Jacob	Stewart	Firestone	6	80	Willard	Remy	Remy	Conn.	6	Auburn 6-39-H
Austin 12	6	4250	142	34x4	Goodrich	2 7/8 x 5	Weid.	12	39.68	1 1/2-Stron.	Vacuum	Muncie	Own	Spicer	Austin	Lavine	Warner	Firestone	6	120	Willard	Delco	Delco	Delco	6	Austin 12
Biddle H.	4	2750	121	32x4	Firestone	3 1/2 x 5 1/2	Buda	4	22.50	1 1/4-Zen.	Vacuum	Warner	Warner	Spicer	American	Gemmer	Warner	Firestone	6	90	Willard	G. & D.	G. & D.	Eise.	6	Biddle H.
Bour-Davis, 20	5	1595	118	32x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	25.35	1-Stron.	Vacuum	B. and B.	Muncie	Mechanics	Salisbury	C. A. S.	Stewart	Perfman	6	115	Willard	Remy	Remy	U. S. L.	6	Bour-Davis, 20
Brewster	5	6800	125	34x4	Kelly-S.	4 x 5 1/2	Own	6	25.60	Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Perfman	6	80	Willard	U. S. L.	U. S. L.	Bosch	6	Brewster
Briscoe 4-24	5	885	104	30x3	optional	3 1/2 x 5 1/2	Own	4	16.9	1-Buick	Gravity	Own	Own	Own	Own	Own	Stewart	Perfman	6	80	Willard	A-L	A-L	Conn.	6	Briscoe 4-24
Buick H-45	5	1495	118	33x4	Goodyear	3 1/2 x 4 1/2	Own	6	27.34	Mar.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	60	U. S. L.	Delco	Delco	Delco	6	Buick H-45
Buick H-49	7	1785	124	34x4	Goodyear	3 3/8 x 4 1/2	Own	6	27.34	Mar.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	60	U. S. L.	Delco	Delco	Delco	6	Buick H-49
Cadillac 57	7	3520	125	35x5	optional	3 1/2 x 5 1/2	Own	8	31.25	1 1/4-Own	Pressure	Own	Own	Spicer	C-Timk.	Own	V. Sicklen	Kelsey	6	Exide	Exide	Delco	Delco	Delco	6-3	Cadillac 57
Campbell C-4	5	850	110	30x3	Goodyear	3 1/2 x 4	Own	4	24.03	Sund.	Vacuum	Muncie	Own	Own	Salisbury	Own	V. Sicklen	Firestone	6	117 1/2	Willard	A-L	A-L	Conn.	6	Campbell C-4
Case U.	5	125	125	35x4	Goodyear	3 1/2 x 5 1/2	Cont.	6	25.35	1 1/4-Ray.	Vacuum	B. and B.	G-L	Stanwell	Col.	Jacob	Stewart	Stanwell	6	117 1/2	Willard	West.	West.	West.	6	Case U.
Chalmers 35-C	5	1685	117	32x4	optional	3 1/2 x 4 1/2	Own	6	25.35	1 1/4-Stron.	Vacuum	Own	Own	U. M. Co.	Timken	Own	Stewart	Kelsey	6	106	Pres.	West.	West.	Remy.	6	Chalmers 35-C
Chalmers 35-C	7	1865	122	33x4	optional	3 1/2 x 4 1/2	Own	6	25.35	1 1/4-Stron.	Vacuum	Own	Own	U. M. Co.	Timken	Own	Stewart	Kelsey	6	106	Pres.	West.	West.	Remy.	6	Chalmers 35-C
Champion, C-6	5	116	116	31x4	Goodyear	3 1/2 x 4 1/2	Own	6	23.4	1-Carter	Vacuum	Own	Own	Mechanics	Peru	Own	Stewart	Own	6	106	Pres.	West.	West.	Remy.	6	Champion, C-6
Chandler	5	1795	123	34x4	Goodyear	3 1/2 x 5	Own	6	29.40	1 1/4-Ray.	Vacuum	B. and B.	Own	Own	Peru	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chandler
Chevrolet F.A. 5 and 2	5	735	102	30x3	Goodyear	3 1/2 x 4	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Hartford	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.A. 5 and 2
Chevrolet F.B.	5	1045	108	32x3	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
Chevrolet F.B.	5	1335	110	33x4	Goodyear	3 1/2 x 5 1/2	Own	4	21.76	1 1/4-Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Own	6	120	Willard	Dyneto	Dyneto	Delco	6	Chevrolet F.B.
C																										

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H. P.	Carburetor Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model				
Germino.	5	1550 122	32x4	Goodyear 31x4 1/2	Ruten.	31x4 1/2	Ruten.	6	23.44	1-Stron.	Vacuum	B. and B.	G-L.	Hart.	W-Weiss American	C. A. S.	Stewart	Firestone	6	88	Willard	Dyn.	Dyn.	Delco	6	Germino.				
Glide 6-40.	5	1655 119	34x4	Goodyear 31x4 1/2	Ruten.	31x4 1/2	Ruten.	6	23.44	1-Ray.	Vacuum	Ovn	Durston	Spicer	Peru	Ditweiler	Stewart	Goodyear	6	80	Willard	Wagner	West.	Wagner	6	6	Glide 6-40.			
Grant.	5	1120 114	32x3 1/2	.....	3x4 1/2	.....	.....	6	21.60	Strom.	Vacuum	Ovn	.....	Mechanics	Peru	Jacob	Stewart	Stanwell	6	90	Willard	Wagner	West.	Wagner	6	6	Grant.	
Hanson.	5	1685 119	32x4	.....	31x4 1/2	Cont.	.....	6	25.35	1-Stron.	Vacuum	B. and B.	Covert	Detroit	Tinken	Gemmer	Stewart	Kelsey	6	80	Willard	A-L	Remy	.....	.....	6	Hanson.	
Hart Jun.	5	995 106	30x3 1/2	.....	31x4 1/2	Ovn	.....	4	16.90	1-Stron.	Vacuum	Ovn	.....	Blood	Adams	Gemmer	Stewart	Stanwell	6	80	Willard	Remy	A-K.	.....	.....	6	Hart Jun.	
Harvard 4-20.	2	850 100	28x3	.....	3x4 1/2	.....	.....	4	14.40	1-Zen.	Gravity	Ovn	.....	.....	.....	Barnes	.....	.....	6	100	Willard	National	Wagner	.....	.....	6	Harvard 4-20.	
Hatfield A.	5	1180 115	32x4	Firestone 31x4 1/2	G. B. & S.	31x4 1/2	G. B. & S.	12	36.30	1-Ray.	Vacuum	G. B. & S.	G-L.	Spicer	Peru	Jacob	Warner	.....	6	100	Willard	Dyn.	Dyn.	Conn.	6	6	Hatfield A.		
Haynes 46.	7	3250 127	34x4 1/2	optional 29x4 1/2	Ovn	29x4 1/2	Ovn	12	36.30	1-Ray.	Vacuum	B. and B.	Ovn	Arvac.	Ovn	Jacob	Stewart	Firestone	6	125	Willard	L-N.	L-N.	Delco	6	6	Haynes 46.			
Haynes 45.	7	2485 127	34x4 1/2	optional 31x4 1/2	Ovn	31x4 1/2	Ovn	6	29.40	1-Ray.	Vacuum	B. and B.	Ovn	Arvac.	Ovn	Jacob	Stewart	Firestone	6	125	Willard	L-N.	L-N.	Ki-Ron	6	6	Haynes 45.			
Hollier 206.	5	1785 116	32x4	Goodyear 31x4 1/2	Cont.	31x4 1/2	Cont.	6	25.35	1-Stew.	Vacuum	Ovn	Ovn	Ovn	Ovn	Gemmer	Stewart	Firestone	6	50	U. S. L.	Apelo	Remy	6	6	Hollier 206.				
Holmes.	7	2000 126	34x4 1/2	Goodyear 31x4 1/2	Ovn	31x4 1/2	Ovn	6	29.40	1-Newc.	Vacuum	B-L	B-L	Spicer	Tink.	Gemmer	V. S. Elgin	.....	12	100	Col.	Dyn.	Dyn.	Eise.	12-0	6	Holmes.		
Hudson O.	7	2100 125	34x4 1/2	optional 31x4 1/2	Ovn	31x4 1/2	Ovn	6	29.40	1-Ray.	Vacuum	Ovn	Ovn	Spicer	Tinken	Jacob	Stewart	Kelsey	6	.....	Exide	Delco	Delco	West.	Delco	6	6	Hudson O.	
Hupmobile R.	5	1450 112	32x4	Goodyear 31x4 1/2	Cont.	31x4 1/2	Cont.	4	16.90	1-Stron.	Vacuum	Ovn	Ovn	Detroit	Ovn	Ovn	Stewart	Kelsey	6	87 1/2	Willard	West.	West.	A-K.	6	6	Hupmobile R.			
Jones.	7	2250 126	34x4	Goodyear 31x4 1/2	Cont.	31x4 1/2	Cont.	6	29.40	1-Ray.	Vacuum	B. and B.	B-L	Arvae	Tinken	Warner	Stewart	Firestone	6	120	Prent.	West.	West.	Remy	6	6	Jones.			
Jordan.	7	2475 127	32x4 1/2	Goodyear 31x4 1/2	Cont.	31x4 1/2	Cont.	6	29.40	1-Ray.	Vacuum	B. and B.	Detroit	Sterling	Tinken	Gemmer	Stewart	Firestone	6	109.8	Willard	Bijur	Bijur	Delco	6	6	Jordan.			
King G.	7	2350 120	34x4	Firestone 3x5	Ovn	3x5	Ovn	8	28.80	1-Ray.	Vacuum	B. and B.	Ovn	Spicer	Col.	Jacob	Stewart	Stanwell	6	117.5	Willard	Bijur	Bijur	A-K.	6	6	King G.			
Kissel.	5-7	2750 124	32x4 1/2	Goodyear 31x4 1/2	Cont.	31x4 1/2	Cont.	6	26.30	1-Ray.	Vacuum	Warner	Warner	Spicer	Ovn	Jacob	Stewart	Stanwell	6	90	Willard	Remy	Remy	6	6	6	Kissel.			
Kline Kar 6-42.	7	1865 121	33x4	Goodyear 31x4 1/2	Cont.	31x4 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	G-L	.....	Hess	Wohlrab	Stewart	Firestone	6	90	Prent.	West.	West.	Conn.	6	6	6	Kline Kar 6-42.	
Lexington R-19.	5-7	1785 122	34x4	Goodyear 31x4 1/2	Cont.	31x4 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	Warner	Hardy	Hess	Warner	Stewart	Goodrich	6	100	Willard	West.	West.	Conn.	6	6	6	Lexington R-19.		
Liberty 10-B.	5	1570 115	32x4	Goodyear 31x4 1/2	Cont.	31x4 1/2	Cont.	6	25.35	1-Stron.	Vacuum	B. and B.	Detroit	Spicer	Tinken	Ovn	Stewart	Firestone	6	88	Willard	Wagner	Wagner	A-K.	6	6	6	Liberty 10-B.		
Loomobile 48.	7	8100 142	35x5	.....	41x5 1/2	Ovn	.....	6	48.60	Ovn	Pressure	Ovn	Ovn	Ovn	Ovn	Ovn	Ovn	Firestone	6	120	Willard	West.	West.	Berl.	6	6	6	Loomobile 48.
Maiborn B.	5	1395 116	32x3 1/2	optional 31x4 1/2	Falls	31x4 1/2	Falls	6	23.44	1-Stron.	Vacuum	B. and B.	Mechanics	.....	Peru	Jacob	Stewart	Stanwell	6	94	Willard	Wagner	Wagner	A-K.	6	6	6	Maiborn B.	
Marmon 34.	7	3950 126	32x4 1/2	.....	31x4 1/2	Ovn	.....	6	33.75	Strom.	Gravity	Ovn	Ovn	Spicer	Ovn	Ovn	Stewart	Stanwell	12	35	Prent.	Bijur	Bijur	Boech	12	6	6	Marmon 34.
Maxwell 25.	5	985 109	30x3 1/2	U. S. 31x4 1/2	Ovn	31x4 1/2	Ovn	4	21.03	1-John.	Vacuum	Ovn	Ovn	Ovn	Ovn	Ovn	Stewart	Firestone	6	120	Willard	West.	West.	Boech.	6	6	6	Maxwell 25.		
McFarlan 127.	6	4300 136	32x4 1/2	optional 31x4 1/2	T-McF.	31x4 1/2	T-McF.	6	48.60	1-Ray.	Vacuum	B. and B.	B-L	Spicer	Tinken	Ovn	Stewart	Firestone	6	120	Willard	West.	West.	Boech.	6	6	6	McFarlan 127.		
Merced Series 4.	7	4500 132	32x4 1/2	optional 31x4 1/2	Ovn	31x4 1/2	Ovn	6	25.35	1-Ray.	Vacuum	Ovn	Ovn	Spicer	Ovn	Ovn	Stewart	Stanwell	6	100	Willard	Remy	Remy	6	6	6	6	Merced Series 4.		
Mitchell E-40.	5	1755 120	33x4	U. S. 31x4 1/2	Ovn	31x4 1/2	Ovn	6	25.35	1-Ray.	Vacuum	B. and B.	Ovn	Ovn	Ovn	Ovn	Stewart	Stanwell	6	100	Willard	Remy	Remy	6	6	6	6	Mitchell E-40.		
Moline-Knight L.	5	2000 118	34x4	optional 31x4 1/2	Ovn	31x4 1/2	Ovn	4	25.60	1-Ray.	Vacuum	B. and B.	Warner	Spicer	Tinken	Jacob	Stewart	Firestone	6	117	Willard	Wagner	Wagner	A-L.	6	6	6	Moline-Knight L.		
Moline-Knight G.	7	2500 122	35x4 1/2	optional 31x4 1/2	Cont.	31x4 1/2	Cont.	4	25.60	1-Ray.	Vacuum	Ovn	Ovn	Spicer	Tinken	Jacob	Stewart	Firestone	6	117	Willard	Wagner	Wagner	A-L.	6	6	6	Moline-Knight G.		
Monitor, M. & O.	5	1575 117	33x4	Miller 31x4 1/2	Cont.	31x4 1/2	Cont.	6	25.35	1-Stron.	Vacuum	B. and B.	G-L	.....	Stanwell	C. A. S.	Stewart	Stanwell	6	110	Prent.	Dyn.	Dyn.	Conn.	6	6	6	Monitor, M. & O.	
Moon Victory.	5	1785 118	32x4	Miller 31x4 1/2	Cont.	31x4 1/2	Cont.	6	25.35	1-Ray.	Gravity	B. and B.	B-L	Spicer	Tinken	Warner	V. S. Elgin	Stanwell	6	100	Exide	Delco	Delco	6	6	6	6	Moon Victory.		
Moore 6-66.	7	2500 125	35x4 1/2	Miller 31x4 1/2	Cont.	31x4 1/2	Cont.	6	29.40	1-Ray.	Vacuum	B. and B.	Warner	Spicer	Tinken	Warner	Stewart	Firestone	6	110	Exide	Delco	Delco	6	6	6	6	Moore 6-66.		
Moore 30.	5	1095 106	30x3 1/2	Firestone 31x4 1/2	G. B. & S.	31x4 1/2	G. B. & S.	4	22.50	1-Mar.	Vacuum	B. and B.	G-L	U. P.	Peru	Ditweiler	Stewart	Firestone	6	80	Willard	A-L.	A-L.	Conn.	6	6	6	Moore 30.		
Nash 8.	5	1490 121	33x4	optional 31x4 1/2	Ovn	31x4 1/2	Ovn	6	25.35	1-Ray.	Vacuum	B. and B.	Ovn	Ovn	Ovn	Ovn	Gemmer	Stewart	Firestone	6	100	Willard	Delco	Delco	6	6	6	6	Nash 8.	
Nash 16.	7	1640 127	34x4 1/2	optional 31x4 1/2	Ovn	31x4 1/2	Ovn	6	25.35	1-Ray.	Vacuum	B. and B.	Ovn	Ovn	Ovn	Ovn	Gemmer	Stewart	Firestone	6	100	Willard	Delco	Delco	6	6	6	6	Nash 16.	
National 6.	7	2450 128	34x4 1/2	optional 31x4 1/2	Cont.	31x4 1/2	Cont.	6	29.40	1-Ray.	Vacuum	Ovn	B-L	Spicer	Col.	Warner	Warner	Firestone	6	110	Prent.	West.	West.	Delco	6	6	6	6	National 6.	
National 12.	7	3050 128	34x4 1/2	optional 31x4 1/2	Ovn	31x4 1/2	Ovn	12	39.08	1-Ray.	Vacuum	Ovn	B-L	Spicer	Col.	Warner	Warner	Firestone	6	110	Prent.	Bijur	Bijur	Delco	6	6	6	6	National 12.	
Nelson.	5	1500 104	32x4	Goodyear 31x4 1/2	Ovn	31x4 1/2	Ovn	4	15.63	1-Zenith	Vacuum	Ovn	Ovn	Ovn	Ovn	Ovn	Stewart	Kelsey	12	72	Willard	U. S. L.	U. S. L.	Boech	12	6	6	6	Nelson.	
Oakland 34-B.	5	1075 112	32x4	Goodyear 27x4 1/2	Ovn	27x4 1/2	Ovn	6	18.99	1-Mar.	Vacuum	North.	Warner	Mechanics	West-Mott	West-Mott	Stewart	Perman	6	85	Prent.	Remy	Remy	6	6	6	6	6	Oakland 34-B.	
Oldsmobile 37-A.	5	1395 112	32x4	Goodyear 27x4 1/2	North.	27x4 1/2	North.	8	26.45	1-Ray.	Vacuum	North.	Warner	West-Mott	West-Mott	Stewart	Perman	6	80	U. S. L.	Remy	Remy	6	6	6	6	6	Oldsmobile 37-A.	
Oldsmobile 45-B.	7	1875 120	34x4 1/2	Goodyear 27x4 1/2	Ovn	27x4 1/2	Ovn	8	26.45	1-Ray.	Vacuum	Ovn	North.	West-Mott	West-Mott	Stewart	Perman	6	100	Exide	Delco	Delco	6	6	6	6	6	Oldsmobile 45-B.	
Olympian 45.	5	1240 112	32x3 1/2	Miller 31x4 1/2	Ovn	31x4 1/2	Ovn	4	16.90	1-Ray.	Vacuum	B. and B.	Ovn	Peru	Warner	Stewart	Perman	6	U. S. L.	A-L.	A-L.	Conn.	6	6	6	6	6	Olympian 45.
Overland 90.	5	985 106	31x4	31x4 1/2	Ovn	4	18.23	1-Tillot.	Vacuum	Ovn	Ovn	Ovn	Ovn	Ovn	Stewart	Stanwell	6	80	U. S. L.	A-L.	A-L.	Conn.	6	6	6	6	6	Overland 90.

Engines—Rutenber; Cont., Continental; Weid., Weidely; North, Northway; H.S., Herschell-Spillman; Lyco, Lycoming; D-Lyco, Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McF., Teetor-McFarlan; M., Monson or Duesenberg; R. & V., Root & Van Dervoort. Carburetor—Strom, Stromberg; Zen, Zenith; Ray, Rayfield; John, Johnson; Mar, Marvel; Sund, Sundman; Stew, Stewart; H-K, Holley-Kington; Newc, Newcomb; Schob, Schebler; Tiltot, Tiltotson; Johns, Johnston. Generator and Motor—A-L, Auto-Lite; West, Westinghouse; W-L, Ward Leonard; Dyn., Dynco; N. E., North East; L-N, Leese-Neville; A-C, Allis-Chalmers; Split, Splitdorf; S-N, Simma-Huff; G. & D., Gray & Davis. Ignition—A-K, Atwater-Kent; Conn., Connecticut; Eise, Eismann; West, Westinghouse; Will, Willard; N. E., North East; K-Remy, Kingston-Remy; Berl, Berling; Bosch-W, Bosch-Westinghouse; Split, Splitdorf. Gearset—G-L, Grant-Less; North, Northway; B-L, Brown-Lipe; Col., Columbia; W-Weiss, Walker-Weiss; C-Tink, Cadillac-Tinken; West-Mott, Weston-Mott. Universals—Hart, Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. Speedometer—J-Man, Johns-Manville; V-Sicklen, Van Sicklen.

Motor Age Monthly Passenger Car Specification Tables—Concluded

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H. P.	Carburetor Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Owen Magnetic Q-36.	7	4200	135x5	35x5	Optional	3 1/2 x 5 1/2	Buda	6	25 35	Zen.	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	24	Willard	Own	Own	Bosch	24	Owen Magnetic Q-36. 2
Owen-Magnetic, W-4.	7	5500	142	35x5 1/2	Optional	4 x 5 1/2	Weid.	6	38 40	Zen.	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	28	Willard	Own	Own	Bosch	28	Owen-Magnetic, W-4.
Packard 3-25.	7	5200	123	35x5 1/2	Goodyear	3x5	Own	12	43 20	Own	Pressure	Own	Own	Spicer	Own	Own	Walham	Firestone	6	120	Willard	Bijur	Delco	7	Packard 3-25.
Packard 3-35.	7	5500	136	35x5 1/2	Goodyear	3x5	Own	12	43 20	Own	Pressure	Own	Own	Spicer	Own	Own	Walham	Firestone	6	120	Willard	Bijur	Delco	7	Packard 3-35.
Paige 6-55.	7	2060	127	34x4 1/2	optional	3 1/2 x 5 1/2	Cont.	6	29 40	1 1/4-Ray.	Vacuum	B. and B.	Own	Spicer	Salisbury	Jacox	Stewart	Keley	6	108	Willard	Remy	Remy	6	Paige 6-55.
Paige 6-39.	5	1555	117	32x4	optional	3 1/2 x 5	Ruten.	6	23 44	1-Stron.	Gravity	B. and B.	Own	Own	Salisbury	Jacox	Stewart	Cleveland	6	108 4	Willard	G. & D.	Remy	6	Paige 6-39.
Paterson 6-46.	7	1725	120	33x4	optional	3 1/2 x 4 1/2	Cont.	6	25 33	1 1/2-Stron.	Vacuum	B. and B.	Own	Hartford	Hess	Jacox	Stewart	Firestone	6	80	Willard	Delco	Delco	6	Paterson 6-46.
Peerless Series 4.	7	2900	125	34x4 1/2	Goodyear	3 1/2 x 5	Own	8	33 80	Ball	Vacuum	Own	Own	Spicer	Timken	Own	Stewart	Stanwell	12	125	Willard	A-L.	A-K.	6	Peerless Series 4.
Phanna R.	7	5000	125	32x4 1/2	U. S.	3 1/2 x 6	Own	4	24 70	1 1/2-H. & N.	Vacuum	Own	Own	Own	Amer.	Own	Warner	Firestone	6	.....	Willard	W-L.	Bosch	6	Phanna R.
Piedmont.	5	1095	114	32x3 1/2	.....	3 1/2 x 5 1/2	Cont.	4	19 60	Carter	.....	.....	.....	.....	Timken	Own	.....	Firestone	6	.....	Willard	Remy	Remy	.....	Piedmont.
Piedmont 6-40.	7	1545	120	32x4	.....	3 1/2 x 4 1/2	Cont.	6	25 35	Zen.	Pressure	B. and B.	Own	Own	Timken	Own	Walham	Goodrich	6-8	135	Willard	Remy	Remy	.....	Piedmont 6-40.
Pi e r-Arrow 38.	7	6006	134	34x4 1/2	Goodyear	4 x 5 1/2	Own	6	38 4	Own	Pressure	Own	Own	Own	Own	Own	Walham	Goodrich	6-8	135	Willard	West.	Delco	6	Pi e r-Arrow 38.
Pi e r-Arrow 48.	7	6500	142	35x5	Goodyear	4 1/2 x 5 1/2	Own	6	48 60	Own	Pressure	Own	Own	Own	Own	Own	Walham	Goodrich	6-8	135	Willard	West.	Delco	6	Pi e r-Arrow 48.
Plot 6-15.	5	1550	119	32x4	Miller	3 1/2 x 5	Tector	6	23 44	1 1/4-Tillot.	Vacuum	B. and B.	Own	Hart.	Spacke	Warner	Stewart	Stanwell	6	.....	Prent.	Delco	Delco	6	Plot 6-15.
Premier 6-C.	7	2585	126	32x4 1/2	Firestone	3 1/2 x 5 1/2	Own	6	27 34	1 1/4-Johns.	Vacuum	B. and B.	Own	Spicer	Timken	Own	Warner	Firestone	6	123 5	Willard	Delco	Delco	6	Premier 6-C.
Reo T.	5	1550	120	33x4	U. S.	4 1/2 x 4 1/2	Own	6	24 3	1-John.	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	108 5	Willard	N. E.	N. E.	6	Reo T.
Revere.	7	3550	131	32x4 1/2	optional	4 1/2 x 6	.....	6	30 63	1 1/4-Stron.	Vacuum	B-L.	Own	.....	Tim-Ball	Own	Stewart	Houk	6	110	Willard	West.	Bosch	6	Revere.
Roamer 6-54.	7	.....	128	32x4 1/2	Goodyear	3 1/2 x 5 1/2	Cont.	6	29 40	1 1/4-Stron.	Vacuum	B. and B.	Own	Arvac	Hess	Jacox	Warner	Hayes	6	115	Col.	Bijur	Bosch	6	Roamer 6-54.
Saxon Y-18.	5	1195	112	32x3 1/2	Goodyear	2 7/8 x 4 1/2	Cont.	6	19 84	1-Stron.	Vacuum	Own	Own	Spicer	Timken	Warner	Stewart	Firestone	6	60	Prent.	Wagner	Wagner	6	Saxon Y-18.
Sayers Six	5	1695	118	32x4	Firestone	3 1/2 x 4 1/2	Cont.	6	25 40	1-Zen.	Vacuum	B. and B.	Own	Arvac	Hess	Warner	Stewart	Firestone	6	80	Willard	Delco	Delco	6	Sayers Six
Scripta-Booth 6-39.	5	1295	112	32x4	Goodyear	2 1/4 x 4 1/2	North.	6	18 90	1-Mar.	Vacuum	North.	Own	Arvac	West-Mott	J. C. W.	Stewart	Perham	6	85	Prent.	Remy	Remy	6	Scripta-Booth 6-39.
Seneca H.	5	900	108	30x3 1/2	optional	3 1/2 x 4 1/2	LeRo	4	15 63	1-Scheb.	Vacuum	Detroit	Own	U. M. Co.	Adams	Ditweiler	Stewart	Prudden	6	88	Willard	A-C.	Remy	6	Seneca H.
Singer, 19	7	5000	139	35x5	Goodyear	4 x 5 1/2	H-S	8	33 80	1 1/4-Ray	Vacuum	Detroit	Own	Spicer	Timken	Own	Stewart	Own	6	.....	Willard	West.	West.	6	Singer, 19
Standard H.	7	2750	127	34x4 1/2	Firestone	3 1/2 x 5	H-S	8	33 80	1 1/4-Ray	Vacuum	B. and B.	Own	Spicer	Timken	Own	Stewart	Firestone	6	162	Willard	West.	Split.	12	Standard H.
Stearns SKL-4	5	2250	125	34x4 1/2	Goodyear	3 1/2 x 5 1/2	Own	6	22 50	1 1/2-Scheb.	Vacuum	Own	Own	Spicer	Stan-Par	Own	Stewart	Stanwell	12	75	Willard	West.	Conn.	6	Stearns SKL-4.
Stephens 8C.	6	1850	122	33x4 1/2	Fiak	3 1/2 x 4 1/2	Own	6	25 35	1 1/4-Till.	Vacuum	B. and B.	Own	Mechanics	C. A. S.	Own	Stewart	Stanwell	6-8	116	U. S. L.	A-L	A-L	6	Stephens 8C.
Studebaker EG.	7	2135	126	33x4 1/2	Goodyear	3 1/2 x 5	Own	6	36 04	1 1/4-Ball	Vacuum	Own	Own	Spicer	Own	Own	Warner	Keley	6	80	Willard	Wagner	Wagner	7	Studebaker EG.
Studebaker EH.	5	1685	119	32x4	Goodyear	3 1/2 x 5	Own	6	29 40	1 1/2-Ball	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Keley	6	80	Willard	Wagner	Wagner	7	Studebaker EH.
Studebaker SH.	5	1825	112	32x3 1/2	Goodyear	3 1/2 x 5	Own	4	19 60	1 1/4-Stron.	Pressure	Own	Own	Spicer	Own	Own	Stewart	Keley	6	80	Willard	Wagner	Wagner	7	Studebaker SH.
Stutz G.	6-7	2550	130	32x4 1/2	Templar	4 1/2 x 6	Own	4	30 63	Stron.	Vacuum	B. and B.	Own	Own	Hardy	American	Warner	Parker	12	.....	Willard	Remy	Remy	6	Stutz G.
Templar 445.	5	2450	118	32x4	.....	3 1/2 x 5 1/2	Own	4	18 23	1 1/4-Ray.	Vacuum	B. and B.	Own	Own	Salisbury	Own	Stewart	Stanwell	6	100	Col.	Remy	Remy	6	Templar 445.
Tulsa, D.	5	1150	117 1/2	33x4	Firestone	5 x 3 1/2	Lycos.	4	19 60	1-Zen.	Vacuum	B. and B.	Own	Arvac	Timken	Own	Stewart	Firestone	6	105	Willard	Remy	Remy	6	Tulsa, D.
Velle 38.	5	1525	115	32x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	25 35	1 1/4-Ray.	Vacuum	B. and B.	Own	Arvac	Timken	Own	Stewart	Firestone	6	105	Willard	Remy	Remy	6	Velle 38.
Westcott B-38.	5	2090	118	32x4	Firestone	3 1/2 x 4 1/2	Cont.	6	25 35	1-Ray	Vacuum	B. and B.	Own	Spicer	Timken	Own	Stewart	Firestone	6	108	Willard	Delco	Delco	6	Westcott B-38.
Westcott A-48.	7	2590	125	32x4 1/2	Firestone	3 1/2 x 5 1/2	Cont.	6	29 40	1 1/4-Ray.	Vacuum	Own	Own	Spicer	Timken	Own	Stewart	Firestone	6	109 8	Willard	Delco	Delco	6	Westcott A-48.
Willis-Knight 88-4.	7	1725	121	34x4 1/2	.....	4 1/2 x 4 1/2	Own	6	27 23	1 1/4-Tillot.	Vacuum	B-L.	Own	Own	Own	Own	Warner	Stanwell	6	120	U. S. L.	A-L.	A-L.	6	Willis-Knight 88-4.
Winton 24.	7	4350	138	35x5 1/2	optional	4 1/2 x 5 1/2	Own	6	48 60	1 1/4-Ray.	Vacuum	.....	Own	.....	.....	.....	Warner	Firestone	6	110	Willard	Bijur	Bosch	6	Winton 24.
Winton 25.	7	3800	132	35x5 1/2	.....	3 1/2 x 5 1/2	Own	6	43 75	1 1/4-Ray.	Vacuum	.....	Own	.....	.....	.....	Warner	Firestone	6	100	Willard	Bijur	Bosch	6	Winton 25.

STEAM CARS

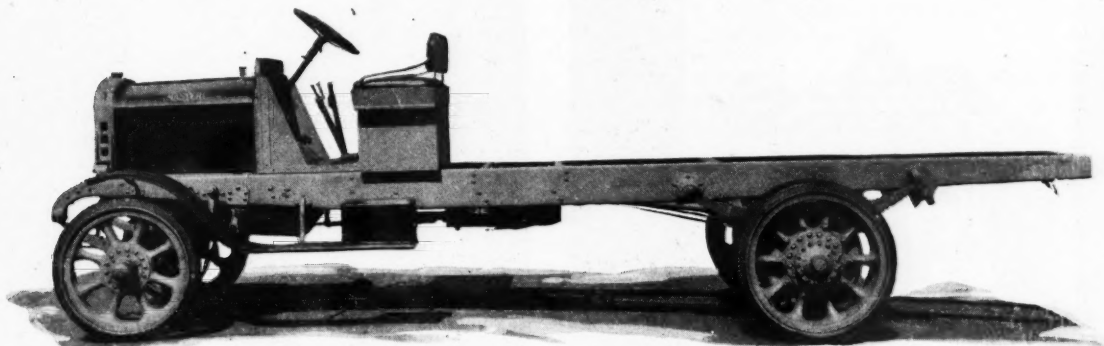
Stanley 735.....	7	3450	130	35x4 1/2	optional	4x5	Own	2	none	none	none	none	none	Own	Warner	Warner	Firestone	6	Willard	Remy	none	none	6	Stanley 735.
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Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H.S., Herschell-Spillman; Lyoo., Lyooming; D.Lyoo., Dort-Lyooming; G.B. & S., Golden, Bulknap & Swartz; T.McF., Testor-McFarlan; M., Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderland; Stew., Stewart; H.K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tilloson; Johns., Johnston. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; M., Westinghouse or Auto-Lite; W., Ward Leonard; Dyn., Dynecto; N. E., North East; L.-N. Leece-Neville; A-C., Allis-Chalmers; Split., Splitford; S-N., Simms-Hunt; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eiscman; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitford. **Gearset**—G-L., Grant-Lee; North., Northway; B-L., Brown-Lee. **Rear Axle**—Col., Columbia; W-Wiss., Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott., Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermod-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen.

Engines—Ruten; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McF., Tector-McFarlan; S., Munsen or Dusenberg; R. & V., Root & Van Dervoort. Carburetor—Strom, Stromberg; Zen., Zenith; Ray, Rayfield; John, Johnson; Mar., Marvel; Sund, Sunderman; Stew., Stewart; H-K., Holley-Kington; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Generator and Motor—A-L., Auto-Lite; West., Westinghouse; S., Westinghouse or Auto-Lite; W-L., Ward Leonard; Dyn., Dyneto; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splittorf. Gearset—G-L., Grant-Lee; North., Northway; B-L., Brown-Lipe. Rear Axle—Col., Connecticut; Eise., Eisenmann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splittorf. Gears—G-L., Grant-Lee; North., Northway; B-L., Brown-Lipe. R. & V., Root & Van Dervoort. Columbus; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, West-Mott; C-Timk., Cadillac-Timken; V-Sicklen, Van Sicklen.

Master Adds 5-Ton Model to Truck Line

Heavy-Duty Design Features Accessibility



Master 5-ton truck chassis, which lists at \$4,890

A 5-ton truck has been added to the Master truck line. From the designer's viewpoint this is a particularly heavy-duty truck, and from the mechanic's standpoint it is a study in accessibility. The truck is assembled from standard parts, and in the list of parts makers are found such names as Buda, Brown-Lipe, Timken and Parish & Bingham. The truck lists at \$4,800 for the standard wheelbase model.

The engine is the new Buda ATU model with 4 $\frac{1}{2}$ by 6 $\frac{1}{2}$ -in. bore and stroke. The cylinders are cast in pairs and are of the L-head type. The valves are of tungsten steel with effective working diameter of 2 $\frac{1}{4}$ in., which makes for high power and easy scavenging of cylinders. The cylinder head is removable, which makes valve-grinding comparatively simple.

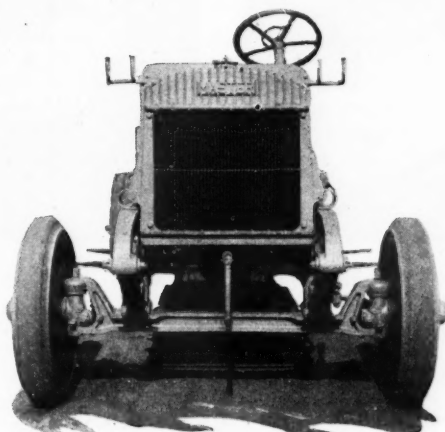
The crankshaft is carried in three extra large bronze-shell, babbitt-lined bearings, the front 2 $\frac{1}{4}$ by 4 $\frac{1}{8}$ in.; center, 2 $\frac{1}{2}$ by 3 $\frac{7}{8}$ in., and the rear, 2 $\frac{5}{8}$ by 4 $\frac{3}{4}$ in. Connecting rod bearings are I-beam chrome-vanadium steel, and camshaft bearings are die-cast babbitt. The entire engine is designed especially for continuous operation on low grades of fuel under heavy load.

Type of Lubrication

Lubrication is by positive force feed, a gear pump forcing the oil, under heavy pressure, to the main bearings and thence through a passage drilled in the crankshaft to the connecting rod bearings. A Master 1 $\frac{1}{2}$ -in. carbureter and a Pierce governor are used. Ignition is furnished by an Eisemann magneto with automatic advance.

The radiator, which is of Master make, is of the tubular type, the core being removable. Frame and tanks are cast iron, which makes for strength and rigidity and protects the cooling section from shocks and strains with flexibility secured by the use of strong C-spring supports. Circulation is effected by centrifugal pump. Extra large water spaces around cylinders and valves insure adequate cooling under all conditions.

Power is transmitted to the worm gear axle through a Brown-Lipe clutch,



The front shows the new type of front axle without center drops

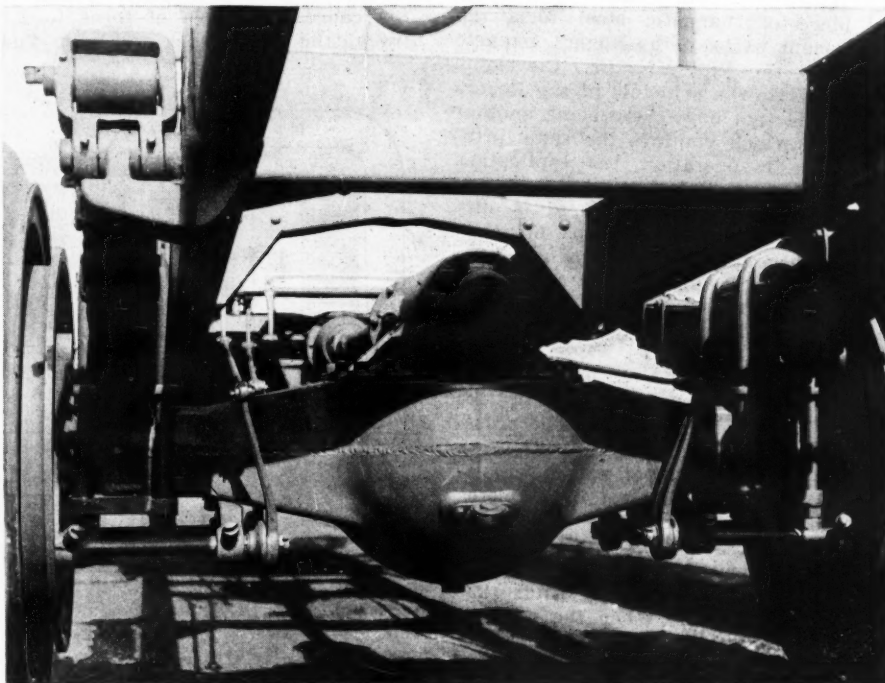
a Brown-Lipe four-speed transmission on a three-point suspension amidships, and

a large tubular propeller shaft fitted with two Spicer and two Detroit universals. The five-plate clutch operates Raybestos-to-steel and the transmission is fitted with alloy steel shafts and gears and carried on Timkin roller bearings. The gears have a 1-in. face and 5/7 pitch. Gear ratio for the various speeds are: Low, 49.61 to 1; second, 29.11 to 1; third, 15.38 to 1; high, or final, 10.25 to 1, and reverse, 59.55 to 1.

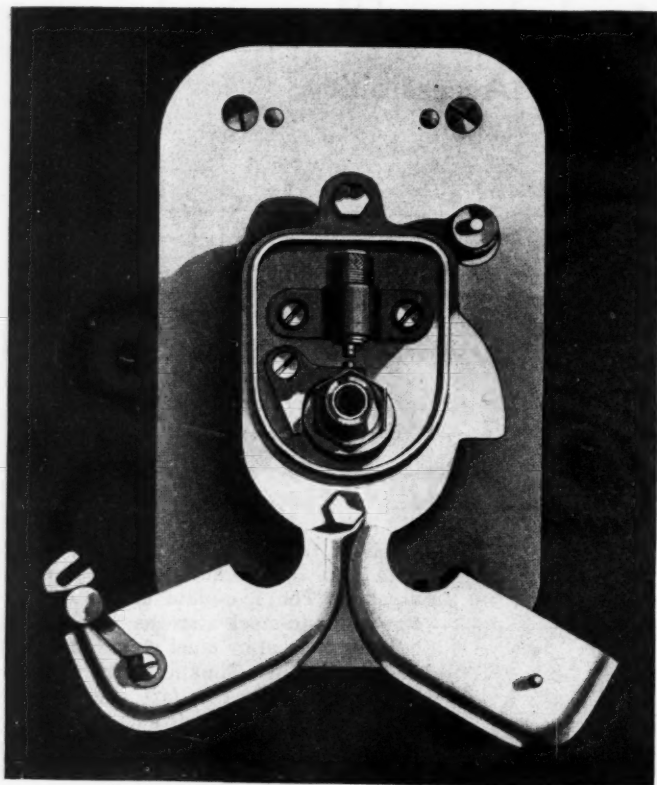
The rear axle is a Timkin worm, full-floating, the worm gear and differential being mounted as a unit. Timkin roller bearings are fitted throughout, and the housing is one-piece, pressed steel with nickel and steel reinforcing tubes.

The front axle also is Timken, being a straight I-beam with no center drop. The beam is 2 $\frac{1}{4}$ in. wide with $\frac{1}{2}$ -in. webs. Spindles are 2 $\frac{1}{2}$ in. in diameter. Timkin roller bearings are fitted to hubs and

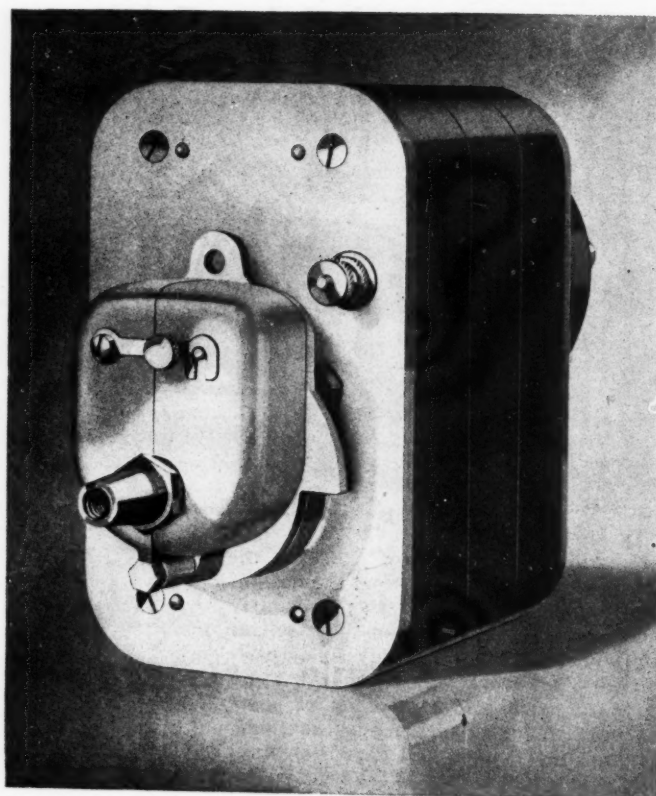
(Concluded on page 49)



The real axle is oversize and sturdiness is found throughout the chassis, as this view shows



End view of the Rogers magneto with the breaker box open showing the knurled screw with which it is possible to make an adjustment while the magneto is running.



Rogers magneto with the breaker box closed, showing the square and compact appearance which this style of magnet design gives. In this the coils are completely inclosed.

Unusual Features in Rogers Magneto

Application of Principle to Design New—Adjustment Possible While Running

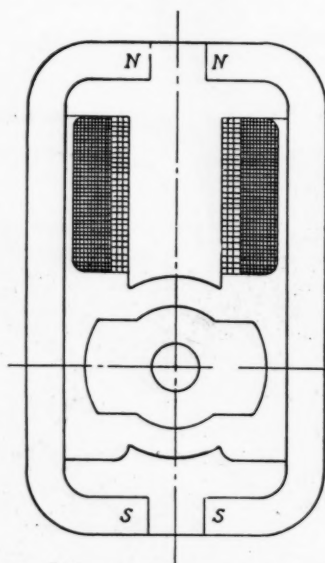
STATIONARY coil and a revolving piece of magnetic steel form the component parts of the Rogers magneto made by the Vita Mfg. Co., Cleveland, Ohio. While the principle of the Rogers magneto is not new, there being another magneto which employs the same principle for its operation, the application to the Rogers design is new. In appearance the Rogers magneto is different from the general type of magneto. The outside of the magneto presents a very square appearance, and since the magnets completely inclose the coils, no windings are visible from the exterior.

The magnets of this magneto are shaped like a widened letter U or like a section of a channel iron. The cross-section shows the method of securing the magnets to the upper and lower distributing blocks. The rotor completes the gap between the upper and lower block.

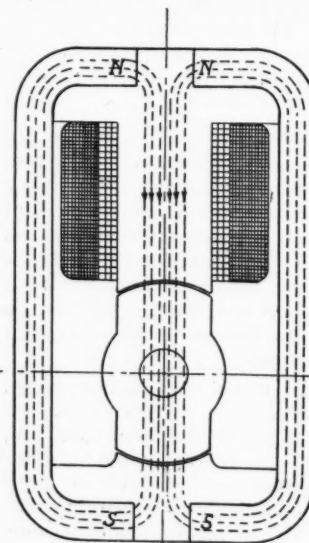
It is this completing and breaking of the magnetic circuit by the rotor that produces the spark. When the rotor is in a horizontal position the lines of force are broken, and there is no flow of the magnetic lines across the gap. As soon, though, as the rotor comes to a vertical position the lines of force are

established, or the circuit is completed. This causes the lines of force to flow through the upper block and in so doing

generates a current in the primary winding. By reason of the secondary winding being wound directly upon the primary



Cross-section of magneto showing the rotor in a horizontal position. The field windings are always stationary



The Rogers magneto with the rotor in a vertical position, completing the magnetic circuit through the field

winding, the current produced in the primary is multiplied many times.

The breaker box of the Rogers magneto is rather unusual, for the points are so arranged that the clearance can be adjusted while the magneto is running. The illustration of the magneto with the breaker box open shows a knurled screw above the contact points, which is the means for making this running adjustment.

Production on this magneto will be under way as soon as the building now under erection is completed, when 70,000 sq. ft. of floor space will be available.

MASTER ADDS 5-TONNER

(Concluded from page 47)

steering knuckle heads. All wearing parts are extra large and fitted with hardened and ground steel bushings.

Insurance against skid chains interfering with brakes is provided by placing both brakes inside the 24-in. diameter drum. Both brakes are cam-actuated, internal expanding. The steering gear is a Ross, semi-reversible, worm and solid nut gear. Wearing surfaces are especially large and double ball thrust bearings are provided.

One of the first things in this chassis to attract the attention of the observer is the exceptionally sturdy frame. The depth of side-rail, 10 in., is exceptionally large for a truck of this size. The special formula channel section stock measures $\frac{1}{4}$ in. in thickness and the flange

is $3\frac{1}{2}$ in. wide. With the standard wheelbase 168 in. is provided back of the driver's seat, while the long wheelbase gives 192 in.

Springs are of the locomotive banded type, of silico-manganese steel, 46 by 3 in., front, and 60 by 4 in., rear. There are thirteen leaves in the front springs and eighteen in the rear. All springs are bronze-bushed. A heavy top rebound leaf is provided with Hotchkiss drive.

Wheels are steel and tires are single, 36 by 6 in. in front and 40 by 6 in., dual, in rear. With the short wheelbase the chassis weight is 8000 lb. and with the long 8200 lb. Each chassis has as equipment driver's seat with cushions, three lamps, folding crank, toolbox, toolkit and siren whistle. The standard color is gray lead, with other colors at a slight extra cost.

GOVERNMENT SELLS 122 TRUCKS

Philadelphia, Sept. 30—One hundred and twenty-two condemned army motor trucks were sold for \$80,000 here, at a government sale held by the Motor Transport Corps, attended by 700 persons. The trucks were in fair condition and the average price was \$660. Minnesota, Illinois and Florida firms were represented among the purchasers.

SHOW TRUCKS AT DAIRY EXHIBIT

Chicago, Sept. 30—Trucks are to be a feature of the National Dairy Show held in Chicago Oct. 6 to 12. Truck makers have recognized the importance of the

dairy industry as a field for exploitation and a number of them including Kissel, Federal, Huffman, Sterling, Maxwell, Oldsmobile, Service, Diamond T, White, Selden, Fulton, All-America, Reo, Ward and Clydesdale have made arrangements to show.

NEW ROADS BODY STATES AIMS

Washington, Sept. 30—The Transportation Bureau which has been established in the Federal Highway Council has adopted the following policy as representing its aims and objects:

To assist in coordinating the highways with the other transportation agencies of the country; to encourage the development of highways which will advance the economic life of the nation, stimulate their use in such a manner as to facilitate and cheapen the transportation of food, raw materials and finished products, and to cooperate with state and national government agencies, to the end that our highways may be of maximum service in the transportation system of the country.

ST. LOUIS TO HOLD RELIABILITY

St. Louis, Mo., Sept. 27—Final arrangements have been made for the tenth annual reliability run of the Automobile Club of St. Louis, to be held Oct. 10-11 to Cape Girardeau and return. The route is 157 miles, and two days will be occupied in making it. Three classes of entries are provided, and anyone can take part in the run.

Valve Timing

Measured in Degrees and Minutes

Motor Age Maintenance Data Sheet No. 56

One of a series of weekly pages of information valuable to the service man and Dealer—Save this page

1919 Cars, Concluded

	Intake		Exhaust		Valve Clearance		Valve Stems		
	Opens After Upper Dead Center	Closes After Lower Dead Center	Opens Before Bottom Dead Center	Closes After Top Dead Center	Intake	Exhaust	Valve Diameter	Diameter	Length
Pilot 6-45	10	50	45	5	.004	.004	1.5625	.372	6 15/16
Premier 6-C	15	38	45	10	.0135	.0135	1.5	.372	5 3/16
Revere	7	11	50	7	.362	.362	2.25	.4375	5 25/32
Roamer C-6-54	10	28	40	2-30	.003	.005	1.6875	.372	6 3/16
Sayers B	12	45	55	12	.003	.004	1.5625	.310	4 21/32
Scripps-Booth	17-30	38	42-30	17-30	—	—	1.2825	.309	4 7/16
Seneca H	10	24	45	5	.004	.006	1.625	.3125	5 1/16
Standard H	8	45	45	8	.003	.003	1.625	.435	6 1/4
Stephens 80	5	49	49	12	—	—	—	.3125	5 3/8
Templar	10	36	50	10	.003	.005	1.75	.375	4 1/4
Tulsa	5	37-42	47-18	10	.003	.003	1.5	.374	5 1/2
Velie 38	0	33	67	0	.025	.025	1.375	.310	5 5/32
Velie 39	10	28	40	2-30	.025	.025	1.53125	.372	6 15/64
Westcott A-38	0	33	67	0	.250	.250	1.375	.310	5 1/8
Westcott A-48	10	28	40	2-30	.3055	.337	1.59375	.372	6 15/64
Winton 24	21	45	54	12	8	8	2.4375	.498	8 15/16
							2.1875		
Willys-Knight 88-4	8	37	48	5					
Willys-Knight 88-8	15	40	50	8					
Willys Six 89	10	28	40	2-30	.002	.002	1.546	1.6875	6 3/16

The Motor Car Repair Shop

Practical Maintenance Hints

Locating Pounds

NEVER in the history of the motor car industry was there an owner, a service station or a repairshop that has not at times pondered many an hour over some strange noise that seemed to baffle all attempts at finding the cause.

Such inconsequential things as body squeaks, brake rod rattles, bird-like twitters that emanate from the springs or fenders need not be taken into consideration in this matter at this time—most of such little sounds come from lack of attention in the matter of lubrication or minor adjustments.

Perhaps the modern and up-to-date car will be made so it will go through a few seasons without any of these annoying trifles, but it has not been discovered, no matter how good it may be. This is not because of the quality of the material in the car or the workmanship or even in the design but rather because of lack of attention on the part of the owner.

Wails from Old Car

Naturally enough the old car more frequently will be guilty of offending than will a new car, which has never been battling over rough country roads for several seasons and without the care a car actually deserves. It is the old car that has served wonderfully for two, three, four or more years that receives the smallest amount of attention and gets the largest share of abuse.

So, it is in the old car that naturally sets forth its wails in the form of thumps, knocks, pounds, rattles and squeaks. And when all of this vast army happen to be working in unison, take it from the mechanic called upon to diagnose the case it is no job for the inexperienced to quiet the nerves of the owner by eliminating even a small proportion of the noises.

An old car, that has performed wonderfully and has seen thousands of miles of service, may be taken as a concrete example of what can be found if a system is employed in the search for these annoyances.

First, let it be known that every observable nut and bolt was gone over and tightened and yet a terrific pound remained. It gave every symptom of badly battered wristpins, connecting rod or crankshaft bearings, but after these had been taken up the pound existed quite as much as before.

Now, let us make this part of the story short by saying that a single engine bolt was causing a thump and excessive vibration and giving every hint that new wristpins were needed, for all

this developed more on a pull than when running along on a smooth street.

Tightening up that one lone engine bolt stopped the engine from raising and dropping every time the pistons made a thrust downward; and each time the front wheels dropped down half an inch from a paving block, the frame of the car simply left the engine bed standing in the air, only to drop again and produce another thump.

Still there was a violent disturbance forward, apparently about the engine, but this was traced to the left half of the bonnet, for when this member was raised and tied over on the other side the second thump disappeared.

It developed that the bonnet was striking violently against the radiator shell, and while it caused no damage, it might have been permitted to do material mischief in time.

Just what caused the bonnet to strike the radiator was revealed when it was found that by no way of lining up or moving the radiator could the bonnet be brought where it belonged and was intended to be, that is, while it would fit nicely at the top of the cowl it gapped badly at the bottom, as shown by the dotted line in the illustration. This naturally forced the front edge of the bonnet against the radiator, with the result that with every little twist of the frame, or any small drop of the wheels into a hole, the bonnet would strike the radiator shell violently and produce a wicked thump.

Now, what caused the gaping at the extreme bottom of the cowl and the bonnet? A common sense view was that the frame had sagged, yet three out of four repairmen of reputation, with straight edges, insisted the frame was perfectly true.

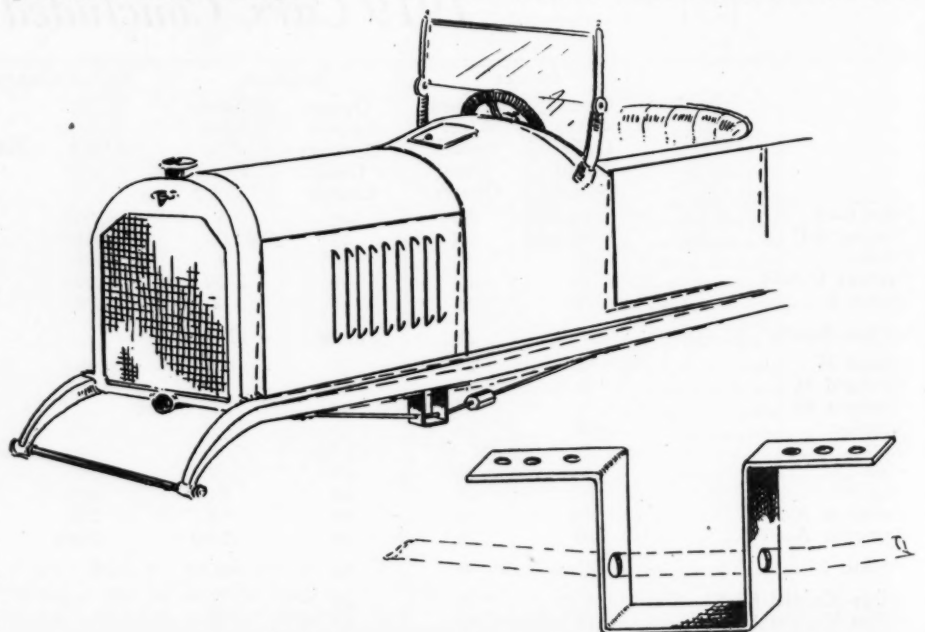
Cutting short argument the owner ordered a truss be installed to strengthen the frame had sagged, yet three out of happened to be sagged. This was the remedy, the working of the turnbuckle bringing the frame up so perceptibly that each twist of the wrench brought the bonnet nearer where it belonged.

Did the Job

After this had been accomplished there was not a single rattle or thump or sound coming from that old car, all of which illustrates the fact that these little things can be discovered if a competent man sets about on a tour of discovery.

Incidentally on this particular job a simple and cheaply and quickly made truss was worked out. So far as the turnbuckle and truss rods were concerned they were simply standard, the latter being of $\frac{5}{8}$ -in. rod, bent as shown, flattened at the ends and anchored to the under side of the frame with three $\frac{5}{16}$ -in. bolts at each end.

The truss standard, however, was a little different from that used in ordinary cases, where usually some form of



Truss installed to strengthen frame, and bring it into line

stud is used. To save work and material and to give as much bearing surface under the frame as possible, a piece of flat iron 2 in. wide and $\frac{1}{2}$ in. thick was selected and bent as shown, the riser being about 5 in. Two or three holes through the top flat section will be sufficient to hold the stud to the frame, and the holes for the rods to pass through can be placed wherever desired.

The nice thing about this stud is that it is impossible for the rod to get away, it gives ample bearing surface under the frame, it is easily and cheaply made, and, having two upright portions, is equivalent to two studs from 2 to 4 in.

This treatment also remedied a badly fitting door that also gave vent to its discomfort in not being properly placed in relation to the rest of the body of the car.

Ignition Trouble

SOMEHOW or other the average mechanic or owner jumps to the conclusion the carbureter is causing all the trouble in an ill-running car, and it is common practice immediately to set to work to change the adjustment or try to remedy some other and quite foreign ill.

For years we have been told by the carbureter makers to leave this part of the motor car outfit alone; that not once in a thousand times is it to be blamed; that it cannot materially change unless the float becomes punctured. Yet we keep on tinkering with the gas-making device and pass a lot of other things that ought to be taken into consideration when something goes wrong with the perfect working of the engine.

Despite the fact that I know every nut and bolt on my car, notwithstanding that my engine had never up to a couple of weeks ago "acted up" on the road, and with the full knowledge that in my particular carbureter there was absolutely nothing that could get out of order and nothing of any nature to adjust, I did as they all do—accused the carbureter.

In a sense I had a right to do so inasmuch as I had spent three afternoons cleaning, going over and fixing everything I could bring to mind. Even the carbureter makers were a little baffled over the fact that at a certain speed the engine would "load" yet would give splendid results at other speeds and at all times. There had never been trouble about starting, there was no vacuum tank and its long pipes to cause trouble about the gasoline feeding, for the tank happens to be in the cowl—yet, trouble came after all this work and all the precision through which I went preparatory to an extended country trip.

Always it has been my play to do my tinkering before I start out rather than spend time fussing on the road and in all cases this policy has worked out to perfection with this one exception. I wished then I had never cleaned the old car.

Practically all of Saturday, much of Sunday and the entire forenoon of a Monday I worked on the car to have it in a condition that would put it over

the road for a hard week's drive and cause not one forced stop unless it happened to be for tire trouble.

Starting out the engine performed splendidly, but it had not gone 15 miles before it developed a decided missing when ascending the slightest grade on a concrete road; and when it tackled a real little hill that should have been made on high it was all it could do to make the top on low and that accompanied with incessant backfiring, something almost unknown to that particular machine.

After that it ran better. It seemed much like a lack of gas; that was the symptom in every way. It seemed for all the world like a stoppage of the gasoline at the screen or in the spray nozzle, yet inasmuch as it was working I stuck to my policy of letting it alone until I could reach my garage.

It might have gone all the way home had I kept it moving, but I didn't; I stopped to visit a friend who had a home in a new subdivision and who was blessed with a graded dirt road leading to his house. It was all right going to the house, but after a stop of a couple of hours things had changed decidedly—for the worse.

The engine started and that is all; it wouldn't move forward in low gear and the engine would stop with even a gentle touch of the clutch. Strange to say it would run backward, and not forward, due no doubt, as I see it now, to the lower gear ratio.

Further Symptoms

Then when a soft spot was reached it quit entirely and refused to have a word to say. That meant there was no gas coming through the feed pipe or that the screen was stopped or something of the sort, but it happened that there was no trouble there.

It didn't seem possible that it could be the magneto, for that had been gone over in the morning—the brushes had been cleaned, the high-tension segments were wiped off and were as good as the day the instrument was made; every plug was cleaned and the points set; the wires had been tested and the terminal set up and cleaned—all the ignition was perfect. Yet not a kick out of that engine.

When priming would bring no hint of an attempt to start I knew it must be ignition, unless the chain operating the camshaft had slipped, and to tell the truth it did look like something of the sort. But I checked up on the valve setting and valve action and that was according to the flywheel marks and there was clearance and all that.

Then it must have been the magneto and visions of trouble came, along with a setting sun and a long way from help, even in the shape of a horse.

Removing the cover to the magneto I started in and checked up on the breaker, finding this to be according to rule and working perfectly when the engine was turned over by the starter.

But I did find a film of carbon on the fiber insulating the high-tension segments, despite the fact that I had so

carefully cleaned that very portion, as well as the distributing brush in the morning. I cleaned it thoroughly, put back the cover and the engine started instantly and ran better than it has in months.

It was all my own foolishness, as I realized afterward, for I had given the fiber and segments the thinnest trace of lubricating oil that was possible—and this had only acted as a distributor of carbon, permitting the high-tension current to run wild and go anywhere but the right place.

Then I found that the "loading" at a certain engine speed disappeared and the car could move along on high gear slower than ever; that I improved my mileage by 2 m.p.g.; that there was no signs of laboring and no hesitancy, and that altogether the engine worked better than it had in a year.

Chiefly, however, I discovered that it is not well to lay the blame to the carbureter and I also discovered the fact that oil must be kept off the high-tension distributor on a magneto.—C. P. R.

WESTON-MOTT PLANT IS SOLD

Detroit, Sept. 26.—The Puritan Machine Co. has purchased from the General Motors Corp. the axle business of the Weston-Mott Co. of Flint, Mich., and will move the stock to the main plant in Detroit. Distribution of service repair parts for Weston-Mott axles will be from this point. The Weston-Mott Co. formerly was a subsidiary of the General Motors.

EUROPEAN PRODUCTION IS SLOW

Kokomo, Ind., Sept. 26.—E. E. Bloom, export manager for the Haynes Automobile Co., has returned from a two months' trip to Europe, where he visited virtually all the countries of Europe to ascertain the motor car situation in foreign fields.

"France and England will not get into anything like quantity production for a year or more," declared Mr. Bloom. "Used cars in these countries are eagerly sought at any price. I know of a case in which a used Rolls-Royce sold for \$20,000."

"The foreign market for American cars is greater than ever. There is a 70 per cent duty on American cars in France, but even so dealers are eager to secure cars. This high duty, which is really an embargo, will continue for probably six months longer. In England we are looking for its repeal in September although a duty of 33 $\frac{1}{3}$ per cent may remain."

As a result of his visit, Haynes dealers are now located in Norway, Sweden, Denmark, Holland, France, Belgium, England, Spain and Italy.

ORDER NECESSITATES NEW FACTORY

Port Huron, Mich., Sept. 26.—The Chief Motors Corp. has received an order for 1000 engines, about \$400,000 worth of business, from the J. T. Tractor Co. of Cleveland. To handle this new business additional factory units must be built. A 10-acre site has been purchased. This company is marketing the Chief tractor engine.

The Accessory Corner

New Fitments for the Car

Ab-rec Rectifier

THE Ab-rec rectifier, while really too small a rectifier for the dealer to use in his shop, is just about the right size for the dealer to sell to his customers as an accessory. The rectifier will charge one battery of 6 to 20 volts at a 2 amp. rate for the 6-volt battery. This rectifier operates on the electrolytic principle. There is no wear in this type of rectifier, except the solution must be replaced occasionally, as it is lost through evaporation. The rectifier is made by the American Battery Co., 1132-1134 Fulton street, Chicago.

Rixie Road Grip

The Rixie road grip is an anti-skid device for use in sandy country and on muddy roads where it is impossible to secure traction. The gripping device is strapped on over the tire, which it fits perfectly because of the molded interior, and presents to the road a wide surface, corrugated with outstanding lugs. One grip is applied to each rear tire. The grips are made four sizes, No. 1 for tires from 30 by 3½ to 32 by 3½; No. 2 tires, 31 by 4 to 34 by 4; No. 3 for 32 by 4½ to 36 by 4½, and No. 4 for tires from 33 by 5 to 37 by 5. The prices of these grips are respectively \$7.50, \$8.50, \$9.50 and \$10.50. The grips are made by W. R. Peterson Co., Milwaukee, Wis.

Dead Easy Tire Pump

The Dead Easy tire pump is of the type that clamps to the running board and is operated with a long handle. This pump has four cylinders, two being low-pressure cylinders and forcing the air into the smaller, high-pressure cylinders. A toggle arrangement transfers the motion of the handle to the pistons, and these, needing very little oil, offer little



Dead Easy tire pump

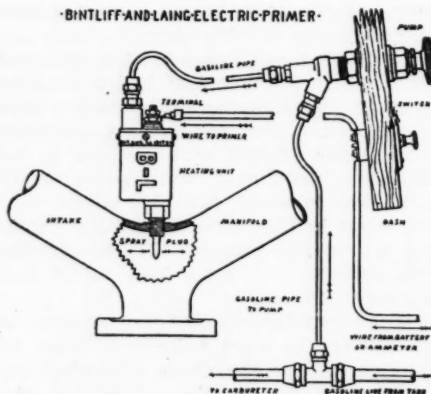
opportunity for the air being mixed with oil as it is forced in to the tires. This pump, which lists at \$20, comes complete with 12 ft. of jacketed hose and a self-retaining tire valve connector. It is made by the Globe Mfg. Co., Battle Creek, Mich.

Electro-Gas Primer

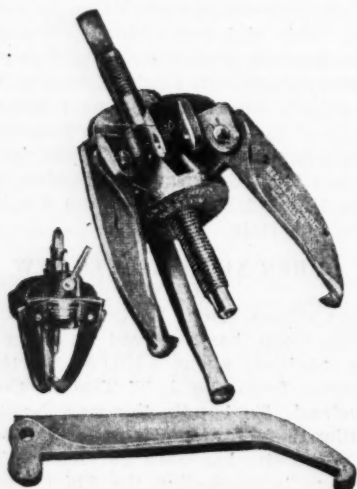
The Bintliff & Laing primer shown furnishes gasoline vapor to the engine by heating the gasoline as it passes through the electric heating coil. A special hand pump is fitted to the dash, with which gasoline is drawn from the gasoline line and is fed from there to the primer. An electric switch also is fitted to the dash from the battery or the ammeter connecting with the terminal on the primer. The primer is manufactured by the Auto Distributing Co., Plainfield, N. J.

Greb Grip Puller

The Greb automatic grip puller is universal in its application. It can be used as a real puller or as an arbor press or as a machine for straightening bent rods or any number of things the ingenuity of the mechanic may determine. The puller is made in three sizes. The large size has a jaw capacity of 18 in. This size puller is intended for heavy work such as is found in large trucks. The small size is for motor car work and is small enough to remove a magneto or pump shaft gear and is large enough to grip any device 7 in. in diameter. An intermediate size also is furnished. These pulling devices are made by The Greb Co., Inc., 173 State street, Boston, Mass.



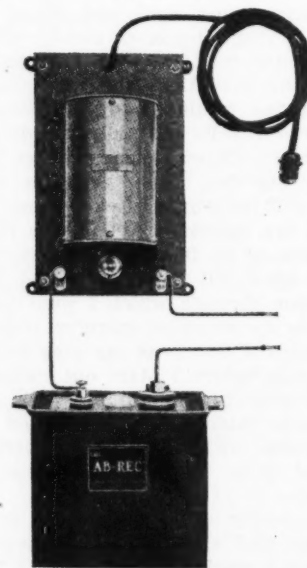
Electro gas primer



The Greb automatic grip puller



Rixie road grip



Ab-rec rectifier

Service Equipment

Time Savers of the Shop

Brown Tube Vulcanizer

THE Brown tube vulcanizer is fitted with eight adjustable clamps which hold the tubes in any position while the tubes are being vulcanized. The clamps are secured to the back of the tube vulcanizer and can be swung to one side while the tube is being fitted to the plate. The top of the plate is machine finished and measures 35 by 6 in. The boiler and plate are cast in one piece, the casting being fitted with a steam gage, safety valve, filler and filler cap. A gas burner regularly is furnished, but if a separate source of steam supply is on hand, the vulcanizer can be had without the burner. This is made by the Jesse F. Brown Mfg. Co., Los Angeles, Cal.

Onan Electrical Tester

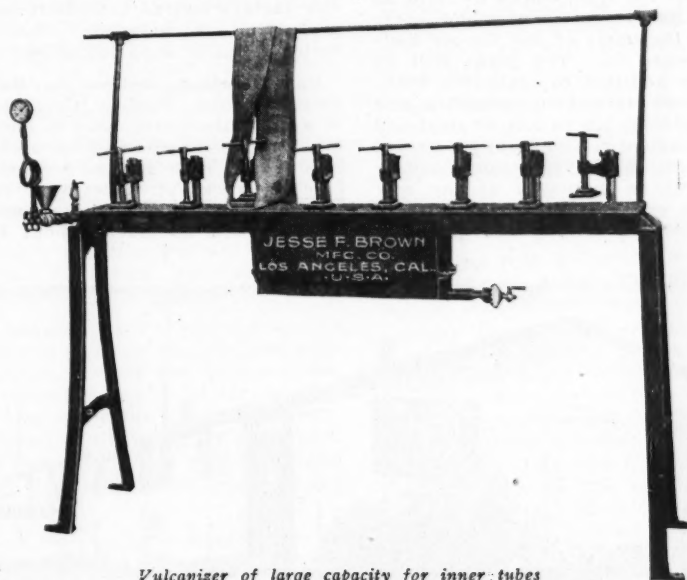
The Onan testing device is built to test generators and starting motors by running them from a special groove pulley driven from the regular line shaft. With this testing outfit it is possible to see the generator or magneto function while it is being driven separately from the car. Cables and meter can be furnished with the outfit. The driving pulley is of one piece and has grooves for five different sizes cut in it. The motor or generator is moved on the sliding

base to any position taking up for the slack in the driving belt. The testing outfit is made by David W. Onan, Minneapolis, Minn.

Stine Screw Holes

In doing body-rebuilding work very handy use can be made of the screw

holes made by the Stine Screw Holes Co., Waterbury, Conn. The screw holes are driven into the material to be screwed together, where they are held firmly by the knurled and grooved surface. The threaded interior of the plug makes a permanent screw hole for machine or wood screws.



Vulcanizer of large capacity for inner tubes

Gage Calipers Cylinders Automatically

Takes Place of Ordinary Caliper

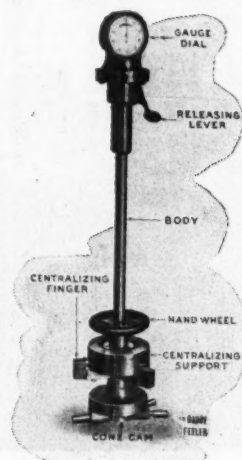
TESTING the bore of a cylinder for roundness with the ordinary inside caliper is a task that requires patience and one that takes considerable time. To make this task easier and to save time on cylinder calipering, the Federal Products Corp., Providence, R. I., has developed a gage that measures the circularity of the bore and with which the measurement is indicated automatically on a dial, graduated to read either way from zero in thousandths of an inch direct and can be read to ten thousandths by reading "between the lines."

The gage feelers are inserted in the cylinder as the illustration shows. These bear at their inner ends by spiral springs against a cone cam directly connected by a steel rod, running through an outer casing to a spur and rack movement operating the dial indicator. A lever is attached to the steel rods by which the cone cam is lowered, thus permitting the feelers to recede sufficiently to be inserted in the cylinder. Once the feelers are inside the bore, pressure on the lever is withdrawn and

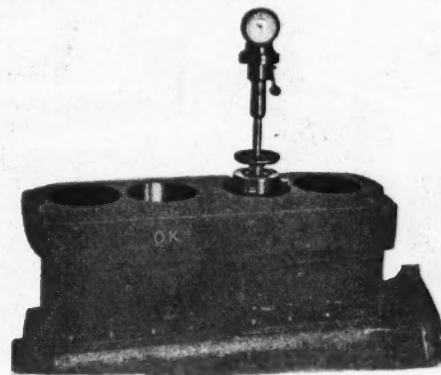
the feelers are automatically released against the surface of the cylinder.

A centralizing support holds the apparatus in position. This support is placed at the mouth of the cylinder and has

three fingers which bind firmly against the walls of the cylinder by a scroll and rack movement operated by a hand wheel. The gage body turns freely and slides in and out through the centralizing support, permitting the feelers to bear wherever desired on the inner cylinder walls. The gage dial, is graduated in thousandths of an inch.



The Federal visible gage caliper for measuring the inside of the cylinder



Showing the Federal gage in application. The dial is visible in any position

Among the Makers and Dealers

Short Trade Notes

KLASSEN Now With F-W-D Truck—Henry P. Klassen, formerly in the motor car trade in Chicago, is now in charge of sales for Missouri and Illinois for Four Wheel Drive Auto Co. His headquarters are in St. Louis.

Addition for Moline Iron Works—The purchase of the Moline baseball park will enable the Moline Iron Works to build an addition to its present plant which operated under the name of the Cooper Saddlery Hardware Co. The plant will be continued in addition to malleable foundry, 110 by 400 ft., and an enameling and finishing building, 110 by 360, of steel and glass, with cement tile roofs to be erected at a cost of about \$200,000. Approximately 250 men will be employed at the new plant. It is expected that operations in the new buildings will start by the first

of the year. The Moline Iron Works make castings for cars, trucks, tractors and farm implements.

Continental Parts Moving—The Continental Auto Parts Co., Knightstown, Ind., will move to the plant at Columbus, Ind., formerly occupied by the Janney Mfg. Co., builder of farm implements. Six times the present floor space is provided in the new factory and an immediate increase in production is planned. The company builds a line of shop equipment.

Pan-American Rubber to Move—The Pan-American Rubber Co., Milwaukee, Wis., manufacturing porous and cellular fillers for pneumatic casings used on light commercial vehicles, has decided to relocate its works at Watertown, Wis. The present factory at Cudahy, suburb of Milwaukee, will be moved about Oct. 1 to

temporary quarters in the former Wiens Brush Co. plant at Watertown. A site of 4 acres has been purchased as a site for a complete new factory to be erected early in the spring of 1920.

McKinney to Manage Morgan Sales—B. R. McKinney has been appointed sales manager for the Morgan Mfg. Co., Keene, N. H., maker of Morgan spark plugs and red pumps.

New England Representative for Specialties—Charles C. Howison has been appointed New England representative for the Hudson Motor Specialties Co., Philadelphia, Pa.

Smith Becomes Vice-President—Pierce G. Smith has been made vice-president of the American Malleable Co., Lancaster, N. Y., and Owosso, Mich. He was formerly sales manager of the company.

Portable Rubber Declares Dividend—The Portable Rubber Co., Akron, O., declared a 1½ per cent quarterly dividend on all outstanding preferred stock of record Sept. 20, payable Oct. 1.

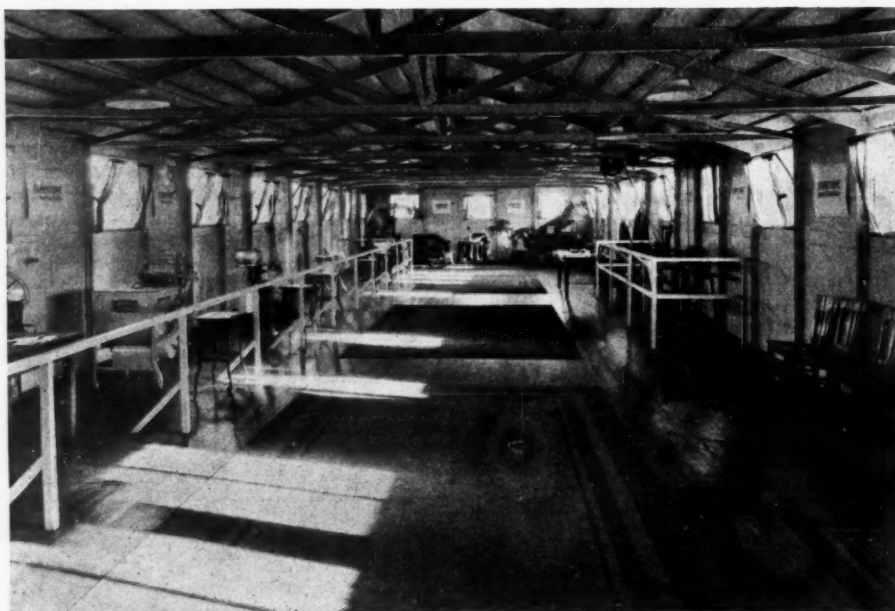
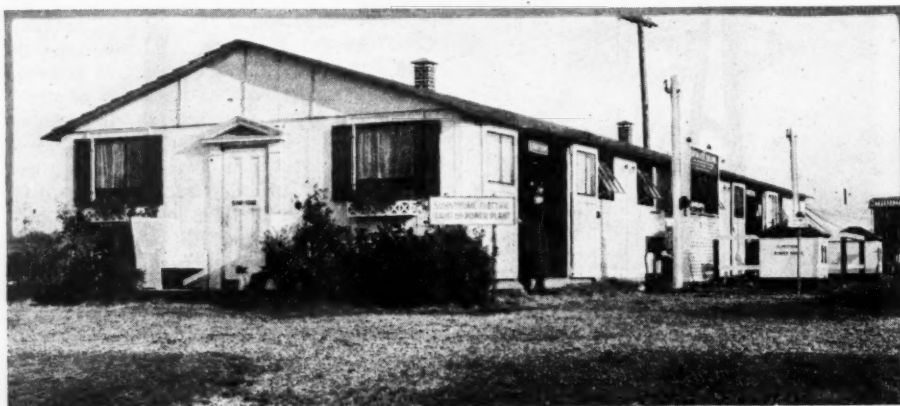
Columbus Cole Dealer to Build—The Cole Motor Sales Co., Columbus, Ohio, recently chartered, will erect a modern garage and salesroom 47 by 187½ ft. It will be two stories high. E. A. Neff is general manager of the concern, which now has temporary headquarters.

Trailmobile Factory Progressing—Construction of the new Trailmobile Co. factory is progressing rapidly. The first unit will be 200 by 500 ft. The company recently made exhibits of its trailer at the California, Texas and Ohio state fairs and also had a display at Cincinnati, Ohio.

Value is Case Foreign Sales Manager—Beverly Mason Value has been appointed foreign sales manager of the J. I. Case Plow Works, Racine, Wis., with offices in New York. He has been identified with T. A. Prouty, Inc.; with the Pittsburgh Testing Laboratories, first as assistant sales manager and later as assistant district manager. After returning from overseas duty as captain of infantry, he became vice-president of Tractors, Ltd.

General Tractors Office in Chicago—The General Tractors, Inc., a Delaware corporation formed with \$1,000,000 capital to take over the Monarch Tractor Co., with main works at Watertown, Wis., will open executive headquarters in Chicago Oct. 1. The present headquarters at Watertown will be continued only as a factory office, with similar provision at the works recently acquired at Paulsboro, N. J., and the Canadian works at Brantford, Ontario. The Chicago office also will contain the sales department. A New York office will be opened.

Earle is Eastern Buda Representative—L. H. Earle, who was released from service as captain in the Ordnance Corps last spring, has been appointed eastern representative for the Buda Co., Harvey, Ill., with offices in New York. While in service, Earle managed the government inspection of tractors and tanks. He for-



SUNNYSIDE EXHIBIT AT MILWAUKEE SHOW—This is how General Motors introduced its power and light unit at the Milwaukee show. In this miniature home Sunnyhome made its debut before the public

merly was with Continental Motors Corp., first as designing engineer and later as sales manager. Previous to that he was chief engineer of the Abbott Motor Car Co. and with Chalmers at Detroit. Just previous to his entering service he was in business for himself as Earle & Boggs, Inc., manufacturers' representatives.

Hall Joins Willys Corp.—Jay V. Hall, formerly general sales manager of the Olds Motor Works, who resigned that position some time ago, is now with the new Willys Corp. and is located at the Duesenberg plant, where he is in charge.

Greiff Joins American Bosch—Victor Greiff, a lieutenant in the naval reserve force in the Bureau of Steam Engineering, has been appointed research engineer for the American Bosch Magneto Corp., Springfield, Mass. His previous connections have been with the Covic Electrical Co., the New York Edison Co. and the General Electric Co.

Curran With Jackson Screw Products—V. L. Curran has resigned as purchasing agent of the Sparks-Withington Co., Jackson, Mich., and has acquired an interest in the Jackson Screw Products Co. He assumed the duties of general manager Sept. 15. Mr. Curran is succeeded by James T. Beadle, many years a buyer for several Jackson manufacturers.

Southern Maker Erecting Plant—The Southern Motor Mfg. Association, Ltd., manufacturer of Ranger cars, trucks, tractors and trailers, has commenced construction of considerable additions to its plant on the 500-acre tract given the company by Houston, Tex. When completed early next year, this plant will be the largest automotive industry in the South.

Racine Rubber Will Add—The Racine Rubber Co., Racine, Wis., western division of the Ajax Rubber Co., Trenton, N. J., has awarded contracts for the erection of a four-story addition to the factory, increasing the area 80 by 160 ft. The building and equipment will represent an investment of \$100,000 to \$125,000. It is expected to be ready for occupancy by Nov. 1 or 15.

Salesroom and Garage for Armleder—The Columbus Armleder Sales Co. will erect a salesroom to be joined to a garage building in which Armleder trucks and certain lines of cars will be sold. It is expected to spend \$50,000 in the new structure which will be 80 by 60 ft. and two stories high. The company was recently reorganized from the Columbus Armleder Motor Truck Co., with an authorized capital of \$60,000, which will be increased later. Jacob Mattlin is president; H. L. Freidenberg, vice-president; Sol. Aarons, secretary, and M. Berman, treasurer and general manager.

Higgins Spring to Increase Output—Reports to the effect that the Higgins Spring & Axle Co., Racine, Wis., had disposed of its entire business to the new Continental Axle Co., Edgerton, Wis., and would retire from the field are declared to be erroneous and an injustice to the company by George L. Peterson. It is officially stated that the Higgins company has sold to the Continental company a new department created a year ago for the manufacture of axles for trucks, trailers and tractors. The Higgins company will continue to manufacture springs for motor vehicles as well as horse-drawn vehicles and axles for wagons, carriages, etc. The output of such goods will be increased and new machinery and equip-

ment is now being installed, replacing the equipment which was sold to the Edgerton company together with the heavy duty axle department.

Parker Heads Lansing Reo—W. Carl Parker has been appointed manager of the Lansing branch of the Reo Motor Car Co., Lansing, Mich., to succeed Clarence Triphagen, who recently assumed the position of manager of the newly-established Detroit branch.

Brush Leaves Factory for Agency—George I. Brush, formerly district sales manager for the Olympian Motors Co., Pontiac, Mich., has joined the sales force of the Welling Motor Co., St. Louis, Mo., distributor of the Olympian, Crow-Elkhart and All-American trucks.

Oshkosh Truck Buys Site—The Oshkosh Motor Truck Co., Oshkosh, Wis., manufacturing all-wheel drive commercial vehicles, has purchase a site for its new works, the first unit of which will be 150 by 300 ft. Work will begin some time in October. William A. Besserlich is president and chief engineer.

Bound Brook Promotes Managers—Harry J. Lindsley, who has been western sales manager for the last seven years for the Bound Brook Oil-less Bearing Co., Bound Brook, N. J., and William F. Jennings, eastern sales manager for the company for the last five years, have been made vice-presidents of the concern.

Sibley Leaves Packard—Hi Sibley, for two years a member of the Packard company advertising staff, and formerly special war correspondent for Motor Age, has resigned and will make his home in California. Frank Kane, for three years with the same department, has joined the staff of Erwin & Wasey, advertising agents, Chicago.

Gloetznor Heads Covert Gear—Alwin A. Gloetznor, formerly vice-president in charge of sales and engineering of the Covert Gear Co., Inc., Lockport, N. Y., has been appointed president and general manager of the company, succeeding P. A. Clum. He will spend four days each week at the Lockport plant and the balance of his time in Detroit.

Munroe to Join Ford in Paris—Russell Munroe has resigned as assistant advertising manager of the Ford Motor Co. to become assistant sales manager of the newly organized Ford Motor Co. branch in Paris, France. Mr. Munroe has been with the Ford organization for several years. He recently returned from France where he served with the French army and later with the American Red Cross.

Body Business Changes Hands—The Bennett-Sustrich Co. has purchased the body manufacturing business of the Southwick-Pom Co. and will continue in the same business. James J. Bennett, formerly superintendent of the Southwick-Pom Co., is president of the new organization. James S. Southwick is treasurer. The reorganized company is one of the pioneer body builders of Detroit.

Globe to Build New Foundry—The Globe Co., Sheboygan, Wis., formerly the Globe Foundry & Machine Co., is separating its casting and machine departments, a new corporation styled the Globe Foundry Co. having been incorporated with \$100,000 capital to build a complete new gray-iron foundry on a new site. The present casting shop will be converted into an addition to the machine shop, doubling the

capacity. G. F. Honold, president of the Globe Co., is one of the principal owners of the new Globe Foundry Co. The company will continue to specialize in automotive castings and parts.

Parts Maker Enlarges Plant—The A. O. Smith Corp., Milwaukee, one of the largest manufacturers of automotive parts in the United States made public today the announcement that arrangements have been completed for the enlargement of its works at a cost of more than \$4,000,000, to increase the capacity approximately 100 per cent.

Columbus to Make Car Bodies—The Columbus Commercial Body Co. is adding equipment and metal working machinery for the manufacture of car bodies. Heretofore the company has confined its output to the manufacture of commercial bodies. It is finishing an order for bus bodies. It will continue to make commercial bodies but will concentrate on motor car bodies.

New Building for Ford Dealer—Work, abandoned during the war, has been resumed on the two-story building for the Ollie E. Hunt Motor Co., St. Louis, Mo., Ford dealer. The lot is 75 by 155 ft. The building will cost about \$60,000. A thoroughfare will pass through the building, connecting with a runway leading to the second floor. A gasoline filling station will be maintained inside the building.

Grand Larceny of Car Charged—Legal points of considerable general interest involving the motor trade recently have cropped up in the inland Empire. At Walla Walla two men were sentenced to indeterminate terms of eight months to ten years for stealing a motor car. The charge was grand larceny, and the defendants denied this form of indictment on the ground that they intended to abandon the car without attempting to sell it and convert the proceeds. The trial judge held that grand larceny had been established.

West Keeps Track of Tourists—More than 8000 tourists have registered in Spokane to date this season, far exceeding the total of any previous year. Fifty-nine different brands of cars are represented, and—in sad disproportion to the number of motors—an old horse-drawn vehicle en tour has booked in at the national trial registries. The formidable flow of motors en tour was emphasized last week when the Vantage ferry on the Columbia river, a link in the Sunset highway, was temporarily put out of commission by high winds. Immediately the current of east and west bound cars was dammed and in a few hours 250 machines had lined up. Ultimately traffic was routed by the Yellowstone trail farther up.

Hubbard Field Is Opened—Hubbard Field, the new aviation ground on the Taylorsville road, 1½ miles beyond Louisville, Ky., was officially opened Sunday morning, and is said to be the best flying field south of Dayton. Covering 50 acres, the field is absolutely smooth and laid off so airplanes can land or take off in any direction. Every facility has been arranged for taking care of planes from other cities and within a week or so three fire-proof hangars will be erected. The Mattingly-Hubbard Motor Co., which operates the field, has not gone in only for passenger carrying and selling of airplanes but also operates an aviation school. Three former army pilots have been engaged as instructors.

From the Four Winds

Glimpses at the World of Motordom

LOUISVILLE-Paducah Road in Spring— Within two weeks five crews will take the field and survey the Ohio River road from Louisville to Paducah. Work on the highway will start as soon as conditions are right in the spring.

Changes in Missouri License Plates—A change will be made in the Missouri motor car license plates for 1920. Instead of 225879, the plates will show 22-58-79, thus enabling the numbers to be more easily read. The word "Mo." and the year will appear under the number next year, instead of at the side.

Air Service Proposed in Japan—An air postal service is to be inaugurated between Tokio and Osaka, Japan, according to the Far Eastern Division of the Bureau of Foreign and Domestic Commerce. The Imperial Aviation Society, a semiofficial organization for the promotion of aviation and the Department of Communications are to co-operate in maintaining this service.

New York Association Will Meet—The sixteenth annual convention of the New York State Automobile Association will be held at Albany, N. Y., Oct. 6-7. The Automobile Club of Albany is making arrangements for the entertainment of the other associations. Two pieces of legislation affecting motorists upon which the convention will take action are amendments to

Coming Motor Events

TRACTOR DEMONSTRATIONS

Ottawa, Ontario Tractor and Farm Machinery Oct. 14-16

RACES

Los Angeles, Cal. Ascot Speedway Nov. 27
Los Angeles, Cal. Ascot Speedway Dec. 29

SHOWS

Toronto, Canada Canadian National Exhibition Aug. 22-Oct. 6
Cincinnati, Ohio Automobile Dealers' Association Sept. 13-20
Springfield, Mass. Eastern States Exposition Sept. 15-20
Waterloo, Iowa Black Hawk County Motor Trades Bureau Sept. 22-28
Detroit Dealers' Association, closed car salon Oct. 6-11
Chicago Automotive Equipment Association Nov. 3-8
New York N. A. C. C. Jan. 3-10
Chicago N. A. C. C. Jan. 24-31
Kansas City, Mo. Kansas City Tractor Club February
Wichita, Kan. Wichita Thresher-Tractor Club Feb. 9-11

the law increasing fees on cars after Feb. 1 and legislation for the licensing and examining on the rules of the road for operators.

Motors in Ontario Show Increase—From Jan. 1, 1919, to Aug. 31, 1919, approximately 120,000 car permits and 9500 truck permits were issued by the Ontario depart-

ment of highways. For the whole of last year there were issued 101,599 permits for cars and 7529 permits for trucks.

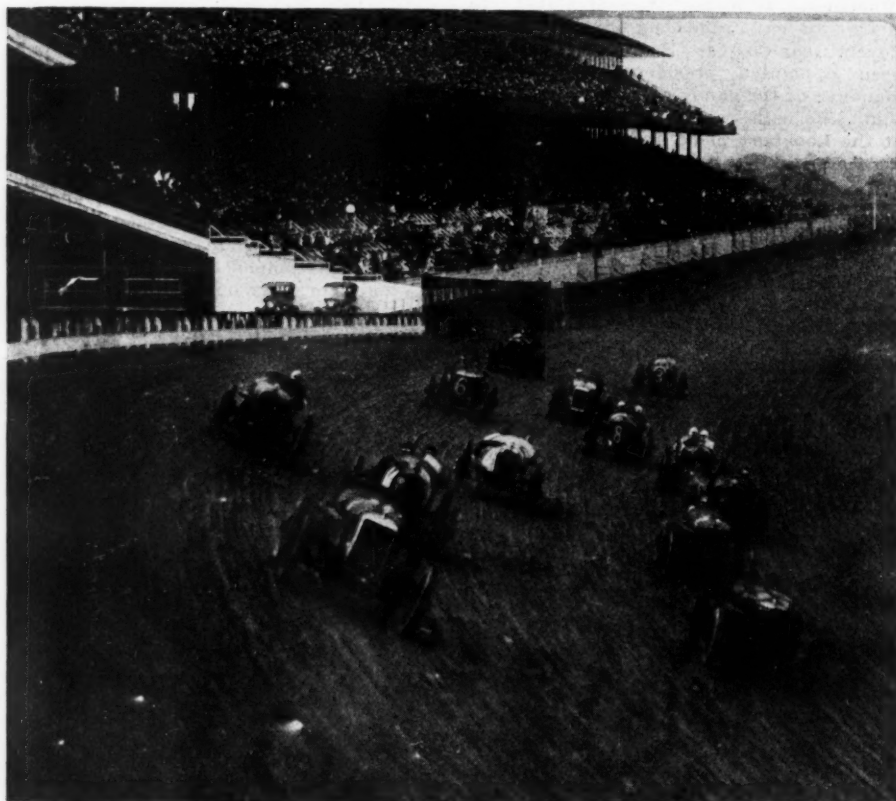
Sardinia Transports Mail by Air—A service for the transportation of mail by airplane was initiated on the island of Sardinia Aug. 16, with service between the aviation fields and the postoffices.

Not Many Prospects Here—Two per cent of the population of Mexico City are able to purchase cars, according to a recent commerce report. The roads are in bad condition and little is being done to improve them.

Truck Exploiters Active—At Memphis the ship by truck movement received good impetus in September by several tours into west Tennessee and north Mississippi. At all towns the truck expeditions were received with great favor.

Cleveland Show Scheduled for January—The nineteenth annual Cleveland show will be held Jan. 17-24 in Wigmore coliseum. This is the same building that has sheltered the Cleveland show for eight years, but this year additional space is provided by the renting of an annex. This annex opens directly off the coliseum and will add about a third additional display room. Fred H. Caley continues as manager of the Cleveland show.

Louisiana to Complete Road Sections—Completion of the Louisiana sections of two of the great transcontinental highways passing through the state by Jan. 1, 1920, is promised by the state highway department, of which Duncan Buie is chief engineer. These roads are the Jefferson highway, virtually completed through seven states, and the Southern National highway, better known as the Old Spanish trail, which begins at Jacksonville, Fla., and runs across the continent to San Diego, Cal. Average cost of these highways is \$10,000 a mile, and the money is in hand for the construction of both links within Louisiana.



HOW A FIELD OF RACERS APPEARS—This picture taken at Sheephead Bay at the last race is a good view of a racing group

ROSS STEERING GEARS

PREDOMINATE on MOTOR TRUCKS

The Commercial Car Journal for August 15 contains advertisements of 75 motor trucks. 43 of this number (57 1/3%) are equipped with Ross Steering Gears.

The Literary Digest for August 30 contains advertisements for 13 motor trucks. 8 of this number (61 1/2%) are equipped with Ross Steering Gears.

There are 230 motor truck manufacturers in the United States. 144 of this number (62 3/5%) are equipped with Ross Steering Gears.

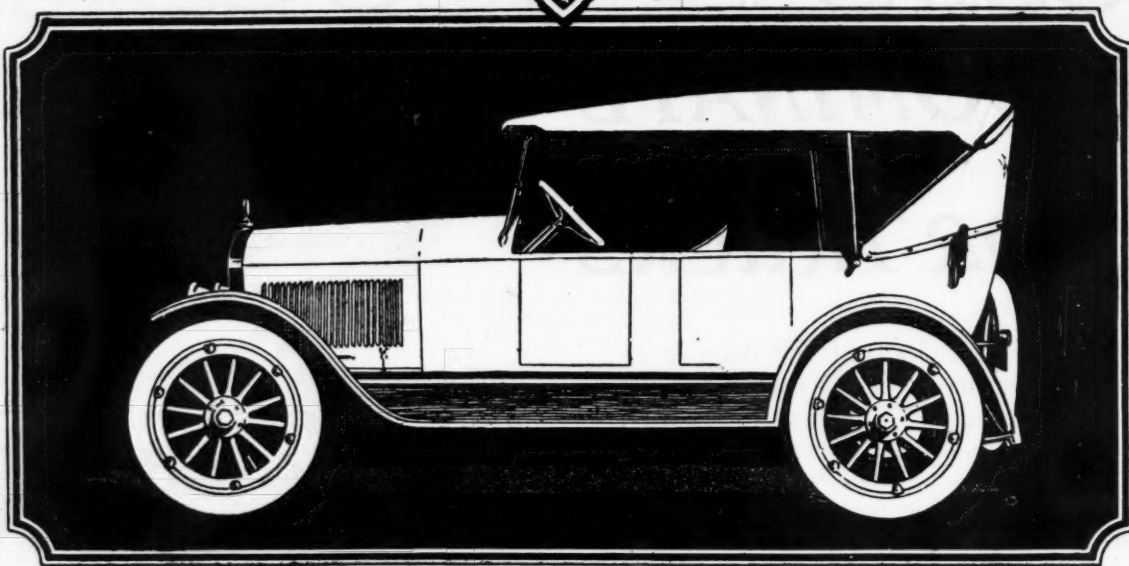
In spite of higher cost, Ross Steering Gears predominate overwhelmingly. Whether you are building or buying a motor truck, bear this fact in mind. For yourself or for your customers, make certain of the easy steering, reliable service and absolute safety which are assured by

ROSS STEERING GEARS

Write for booklet, "Choosing a Motor Truck," and for complete list of 144 different trucks equipped with Ross Steering Gears.



ROSS GEAR & TOOL COMPANY, 400 HEATH ST., LAFAYETTE, IND.



BEAUTY

The beauty of the Crow-Elkhart Six is more than surface-deep. True, the beauty of finish evidenced in the smart lines and exquisite appointment wins constant admiration. But there is hidden beauty—beauty of construction down 'neath the enamel and nickel—beauty of performance in the smooth, rhythmic flow of multi-power from the silently running motor.

CROW-ELKHART Multi-Powered

SIX CYLINDER MODELS

Model H-55, Five Pass. Touring Car.....	\$1545
Model H-53, Three Pass. Roadster.....	\$1545
Model H-54, Four Pass. Roadster.....	\$1695
Model H-56, Coupe.....	\$2195
Model H-57, Seven Pass. Sedan.....	\$2395

FOUR CYLINDER MODELS

Model L-55, Five Pass. Touring Car.....	\$1295
Model L-53, Three Pass. Roadster.....	\$1295
Model L-54, Four Pass. Roadster.....	\$1445
Model L-56, Coupe.....	\$1945

WRITE FOR OUR CATALOG CONTAINING FULL INFORMATION

CROW ELKHART MOTOR CORPORATION, DEPT. 102, ELKHART, INDIANA

Export Department, Broadway at 53rd St., New York City, U. S. A.

DEALERS will immediately recognize the unusual opportunity that the representation of the Crow-Elkhart Multi-Powered Line offers. Desirable territory is still open. Write today for particulars about our attractive dealer franchise.

MICHELIN

AN OPPORTUNITY

Notwithstanding the popularity of Michelin Tires, there are some towns where dealers can still secure this valuable account. In these towns we offer the following:



1st—A thoroughly tested cord tire, made by the oldest pneumatic tire maker in the world.

2nd—A fabric tire of unsurpassed quality sold at a moderate price.

3rd—The only ring-shaped tube on the market—a tube that sells itself.

4th—One of the biggest and most impressive tire and tube advertising campaigns ever conducted.

5th—Special sales helps for individual dealers.

We invite you to write us now.

MICHELIN TIRE COMPANY

Milltown, New Jersey



THE greater beauty and smartness which Hayes Wire Wheels give to any car are almost universally recognized.

But their superior strength over other types is not so widely known.

You have probably noticed that racing cars are all equipped with wire wheels nowadays.

Drivers like Oldfield, DePalma, Mulford and Rickenbacker, insist on wire wheels.

Because most wheel breakages come from skidding, or thrust blows.

In such circumstances, Hayes Wire Wheels have nearly twice the strength of old-fashioned wheels.

You may prefer Hayes Wire Wheels for their added style, but you should not overlook their greater safety.

A dozen spokes, or more, can be removed from a Hayes Wire Wheel without interfering with its functions.

The fact that wire wheels are much more quickly and easily changed in case of tire trouble is also an important factor.

Racing men lack your appreciation of the *beauty* of Hayes Wire Wheels, but they do value immeasurably the convenience of changing a tire with one-eighth as many operations as a demountable rim requires.

Your own motor car dealer, or the Hayes sales and service station in your locality, will supply Hayes Wire Wheels for your car in any color.

DEALERS: If there is no sales and service station for Hayes Wire Wheels in your vicinity, write us at once for our exceptional dealer proposition.

Wire Wheel Division Hayes Wheel Company Jackson, Mich.
World's Largest Builders of Wheels—Wire, Wood, Steel

Sales and Service Stations:

Brooklyn Service Co.	Chicago Wheel & Rim Co.
1194 Bedford Ave. Brooklyn, N.Y.	2010-12 Wabash Ave. Chicago, Ill.
Hayes Wire Wheel Sales Corp.	Auto-Marine Service Co.
842-7th Ave. & 146 W. 55th St. N.Y.C.	1027 Nicollet Ave. Minneapolis, Minn.
Evans & Lawrie Co.	Interstate Auto Company
1090-2 Commonwealth Ave. Boston	206-8 E. Superior St. Duluth, Minn.
Samuel Scott	Motors Equipment & Tractor Co.
2038 Ranstead St. Philadelphia, Pa.	1310 S. Grand Ave. Los Angeles, Cal.
Miller & Woodward	H. V. & C. H. Carter
3751 Bigelow Blvd. Pittsburg, Pa.	724 Van Ness Ave. San Francisco, Cal.
Brigman Motors Company	Automotive Supply Company
491 Whitehall St. Atlanta, Ga.	1558 Broadway, Denver, Colo.
Siggins Sales Company	The Three Captains Co.
106-8 E. Milwaukee Ave. Detroit	700 S. Ervay St. Dallas, Texas
Eldredge Buick Company	
Seattle, Wash.	

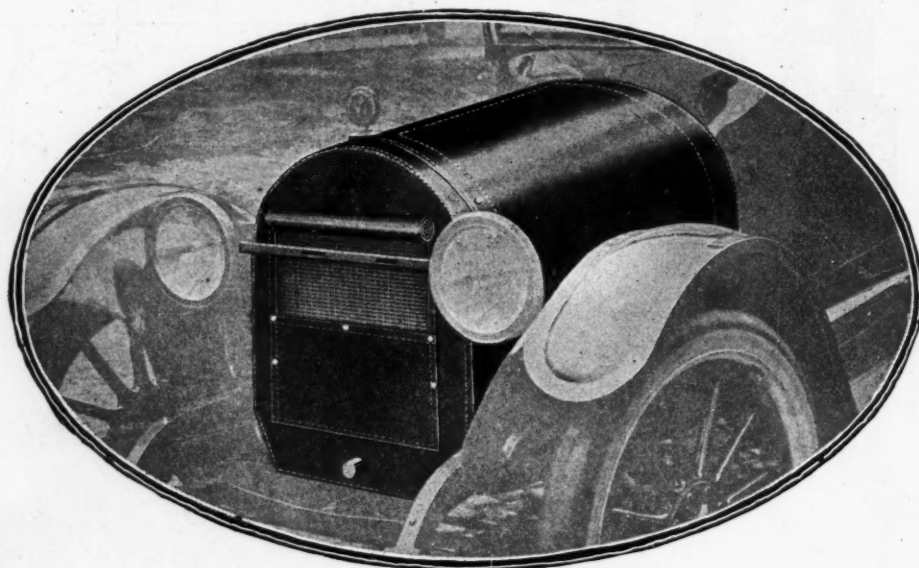


HAYES *wire wheels*

Baker
SIGN OF THE BEST
SINCE 1870

Baker Hood and Radiator Covers

Baker
SIGN OF THE BEST
SINCE 1870



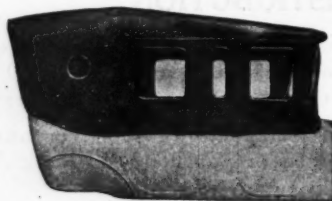
Popular—and Easy to Sell!

MOTOR CAR owners everywhere appreciate the importance of motor protection in cold weather. Be prepared for the great demand for "Baker" Hood and Radiator covers. Make money by selling your customers these better covers. Every sale you make creates a booster for your store! It's easy to sell "Baker" Covers. Car owners in your ter-

ritory know that with them there is no longer any danger of frozen radiators or cracked water jackets!

We also have ready for delivery many other popular "Baker Winter Necessities," such as "Over the Top" Auto Tops, Anti-Draft Shields, Foot Pedal Shields, Bad Weather Mats and Rain Guards.

Buy "Baker" Automotive fabric products from your jobber or write direct to our nearest factory.



"Over the Top" Auto Tops convert your open car into a sedan. Easy to install.



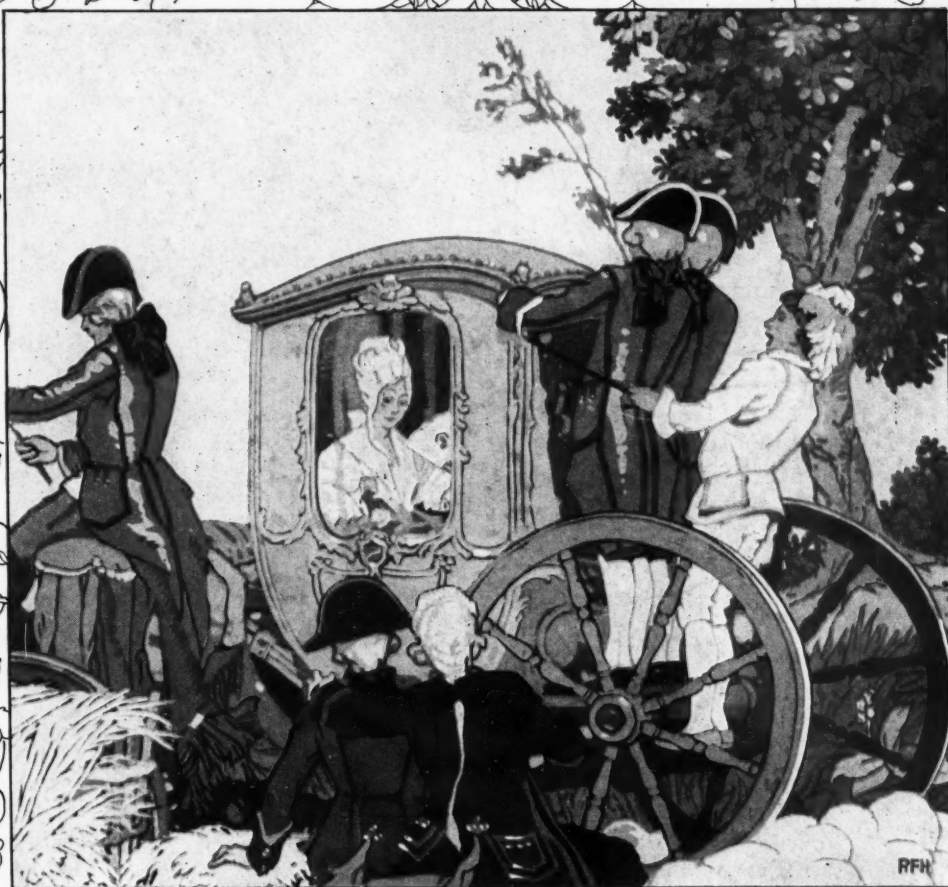
"Baker" Tire Covers are made of superior quality fabrics—all sizes

BAKER AND LOCKWOOD MANUFACTURING CO.

BROOKLYN, N. Y.
473 Kent Avenue

KANSAS CITY, MO.

CHICAGO, ILL.
3021-23 Michigan Ave.



ANNOUNCING AN
ENTIRELY NEW MODEL
GRANT SIX
LARGER HANDSOMER
The Epitome of Smartness





A LARGER AND HANDSOMER GRANT SIX FEATURING SMARTNESS WITH DEPENDABILITY

IT is with pride and confidence that we present the new Grant Six. As will be instantly discerned from a study of the illustration, this entirely new model is larger, handsomer and, of course, more powerful than any previous Grant Six. In it is embodied the full experience gained from building and marketing over fifty thousand light weight sixes.

While this new Grant expresses the light weight principle that has been a fundamental of Grant design, it is so much bigger and finer than any Grant Six heretofore built that it brings the Grant Six into an entirely new field from the standpoint of both performance and quality.

Its roomy body is one of the most beautiful ever designed. It combines the rakish, speedy lines of a sport model with the genuine comfort and roominess of a full size five-passenger touring car. It is a handsome car viewed from any position. Its long, low straight lines fairly melt into the bonnet. The new style radiator is imposing in appearance and completely in harmony with the body

lines. The top is well designed and well made. The upholstery is in genuine leather, luxurious and comfortable. Seat springs are the finest money can buy. Inside trimming is finished with leather-covered moldings. Steering wheel is 18-inch notched mahogany and carries both spark and throttle control. Instrument board is mahogany finished. Tool kit is carried in the left front door. Equipment includes a power tire pump and Boyce motometer in addition to the accessories usually furnished.

You will agree with us that the new Grant epitomizes smartness, comfort and fine engineering. Every mechanical detail measures up to the highest expectations.

GRANT MOTOR CAR CORPORATION · CLEVELAND

THE CHASSIS EXHIBITS REMARKABLE STRENGTH AND OPERATING EASE

Everything about the chassis denotes strength, permanent durability and convenience. It is finely designed and finely built.

The motor is powerful, clean, compact and accessible. It will make any grade that any man wants to make. It will take the car as fast as most men dare to ride and still have power in reserve. It is an overhead-valve motor with balanced crankshaft of extra large dimensions, three large bearings and a force feed oiling system that insures positive lubrication of every moving part. There are many features about it that contribute to lightness and guarantee new standards of performance that cannot be more than mentioned in this condensed circular. Suffice to say, its flexibility is pronounced, its power unusual, its economy certain. We believe buyers everywhere will be won instantly by its high quality and remarkable performance.

EXTRA DEEP DROP FRAME

The frame is of extra deep section pressed steel, supplying a firm, substantial foundation, permanent, secure and equally suitable for open or enclosed bodies.

LONGEST SPRINGS EVER USED WITH THIS WHEEL BASE

Springs are semi-elliptic both front and rear—38 x 2-in. in front and 56½ x 2-in. in rear—the longest springs ever used in a car of 116-inch wheel base, the rear springs being underslung. These springs are almost flat with the car loaded, the ideal toward which all engineers have striven, resulting in the easiest riding car that can be produced. Both front and rear springs are equipped with oil-less bushings, (permanently lubricated). These bushings are a comparatively new invention, the use of which has

heretofore been confined to the most expensive cars. The advantages are, of course, the elimination of squeaks together with oil cups and grease cups at these points. The spring shackles are extra long and strong.

BIG, STRONG AXLES

Front axle is a drop forged I-Beam with steering connections of extra strength. The rear axle is floating type with one-piece pressed steel housing of exclusive design, fifty per cent stronger than the conventional two-piece housing, with 12-inch equalized brakes. All brake connections have permanently lubricated bushings. These are Columbia axles of the finest quality, workmanship and design.

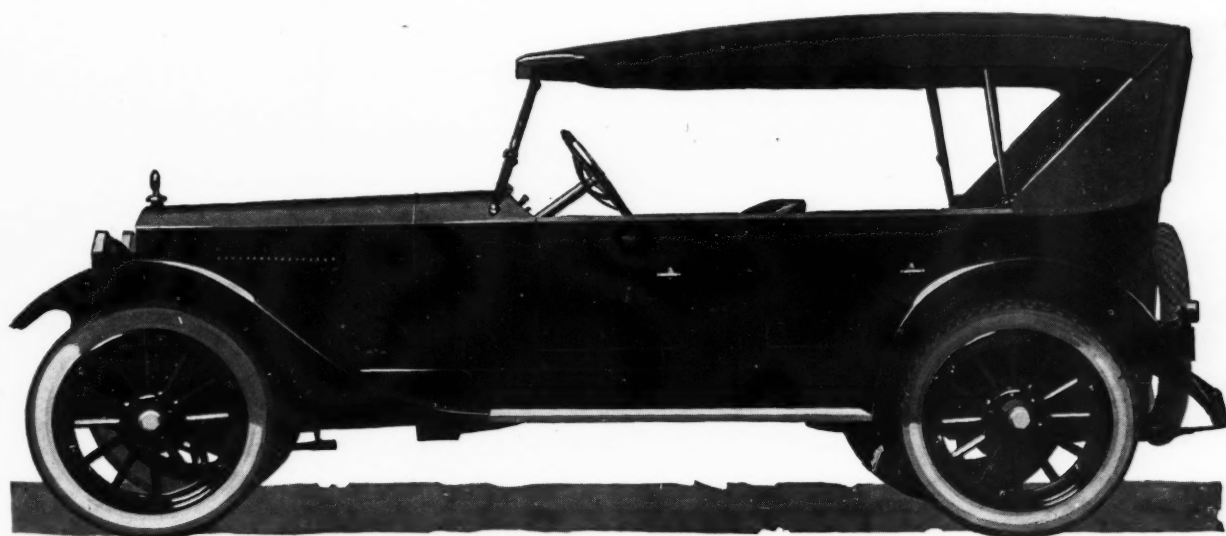
OTHER IMPORTANT DETAILS

Propeller shaft is of tubular type with two Spicer universal joints. Transmission is of the highest grade with nickel steel gears and shafts operating with utmost ease and quietness.

Clutch is 10-in. Borg & Beck disc clutch—the best the market affords. Special attention has been paid to the steering gear. It is of the irreversible type and of finest quality; the bearing surfaces of the steering connections are all bushed. This car steers with the greatest ease and has a remarkably short turning radius.

A careful reading of the specifications will reveal the story of Grant quality in detail. After studying them we feel certain you will agree with those who say that we have succeeded in building the world's handsomest and most efficient light Six.

Details of enclosed models, including a four-door, five-passenger Sedan and a three-passenger Coupe, will be announced later. Specifications are given on next page.



GRANT MOTOR CAR CORPORATION • CLEVELAND

SPECIFICATIONS OF THE GRANT SIX

MODEL "H"

MOTOR—Six cylinder, over-head valve engine— $3\frac{1}{8}$ x $4\frac{1}{4}$ -in. bore and stroke, balanced crank shaft, force feed oiling system; three-ring piston; piston displacement 195.6 cu. inches. S. A. E. rating 23.44 H. P.

CARBURETOR—Improved Stromberg with permanent hot air tube, connected to hot air box integral with exhaust manifold. Stewart Vacuum gasoline feed placed on dash with 16-gallon tank in rear.

STARTING AND LIGHTING—Two-unit starting and lighting system with excessive capacity generator. Fly wheel, starting gear clutch and clutch throw-out completely housed.

CLUTCH—10-in. Borg & Beck dry disc clutch.

IGNITION—Atwater-Kent ignition with improved timer controlled from steering post. Prestolite storage battery.

AXLES—Drop forged front axle, Columbia Standard I-Beam with extra strong steering connections.

Rear Axle: Columbia three-quarter floating, with one-piece pressed steel housing—fifty per cent stronger than ordinary two-piece housing. 12-in. brakes equalized; brake connections equipped with permanently lubricated bushings.

STEERING GEAR—Bearing surfaces of steering connections bushed. Irreversible steering gear of large size; split-nut type; continuous jacket tube.

CONTROL—Spark and throttle control on steering wheel, also horn button. 18-in. notched mahogany steering wheel. Exceptionally long nickel plated emergency brake lever, and extra long gear-shift lever.

SPRINGS—Front springs 38 x 2-in., almost flat under load, oil-less bushings. Rear springs $56\frac{1}{4}$ x 2-in., almost flat under load; oil-less bushings. Both springs semi-elliptic.

DRIVE—Ideal Hotchkiss with underslung rear springs.

TRANSMISSION—Durstons, three speeds forward and reverse. Speedometer drive from transmission.

PROPELLER SHAFT—Tubular. Spicer universal joints.

FRAME—Exceptionally strong, $5\frac{1}{2}$ -in. deep, $\frac{1}{8}$ -in. stock, $2\frac{3}{8}$ -in. flanges; liberally reinforced.

RADIATOR—Black enameled, reinforced double shell construction with removable core; mounted on trunnions.

FENDERS—Black enameled latest "Airplane" type design, well reinforced. Anti-squeak pads interposed between fenders and frame. Head-lights carried on steel brackets joined to fenders.

WHEEL-BASE—116-in. 11-in. road clearance.

TIRES—32 x 4-in. Non-skid on rear. Firestone demountable rims.

TOP—One-man top made of "Neverleak" fabric. Plate glass rear window. Side curtains opening with doors.

BODY—Bevel edge; continuous front seat; Marshall cushion springs; genuine leather upholstery, semi-bright finish, French pleated. Outside nickel door handles; aluminum molding between radiator and hood, also between hood and body.

COLOR—Grant Blue with black fenders and splashers.

WHEELS—Artillery type, Grant Blue.

EQUIPMENT—Complete equipment, including Boyce motometer and Kellogg Power Tire Air Pump.

FOUR BODY STYLES:

Touring Car—Five Passengers.....\$1495
Roadster—Three Passengers..... 1495

Sedan (Four Doors)—Five Passengers.....\$2450
Coupe—Three Passengers..... 2450

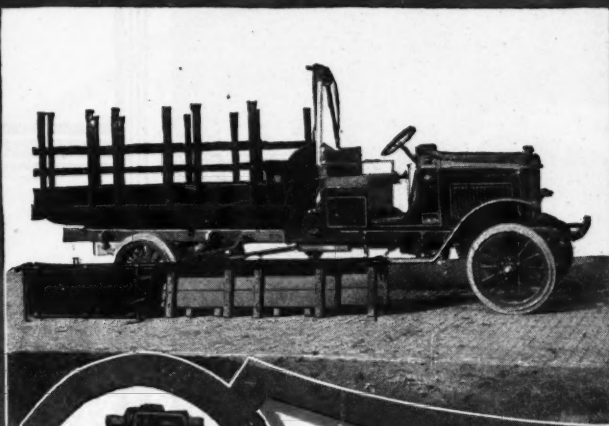
AN OPPORTUNITY FOR DEALERS RIGHT NOW

At this moment we are adding to our sales organization. There are several wonderful opportunities for both distributors and dealers.

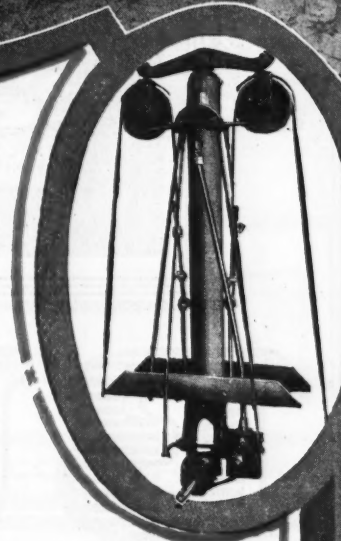
The pictures of the new Grant Six and the detailed description give you a good idea of the big market that exists in your own territory.

Greatly increased facilities, ample capital and a demand that refuses to be satisfied are back of our big production program. Write, wire, or come to the factory for further information.

GRANT MOTOR CAR CORPORATION • CLEVELAND



How Alert Truck Dealers Are Increasing Their Sales



Business dealers have come to realize that the body is an important part of the motor truck. Those dealers are making money. They are increasing the efficiency of the trucks they sell by supplying the buyer with the proper body.

Many progressive dealers have secured the Dailey agency for wood and steel bodies as well as hand and hydraulic hoists.

A Dailey connection means more than truck bodies—it means service—assist-

ance to dealers and their customers in selecting or designing the most efficient type of body. It means selling help for the dealer, prompt deliveries and every kind of service that helps you sell more trucks and bodies.

Write for more detailed information regarding various types of bodies and dealer discount.

H. R. DAILEY, Auto Truck Steel Body Co.

3028 Carroll Avenue

CHICAGO

Steel and Wood Body Distributors

Auto Hoist & Body Company, 18 Bainbridge Street, Brooklyn, N. Y.

Simplex Body Co., 1170 Jefferson St., Buffalo, New York.

The Truck Engineering Co., 3533 Cedar Avenue, Cleveland, Ohio.

Simplex Mfg. Co., Conneautville, Pa.

The John Immel & Sons Co., Columbus, Ohio.

Springfield Commercial Body Co., 385 Liberty Street, Springfield, Mass.

Springfield Body Co., Cambridge, Mass.

Hydraulic Hoist Mfg. Co., 715 Lorraine Avenue, Detroit, Mich.

Auto Hoist & Body Co., 333 Avenue B, New York City, N. Y.

Troy Trailer Co., 5 North 21st Street, Philadelphia, Pa.

Thomas & Company, Brad-dock Avenue, near Forbes Street, Pittsburgh, Pa.

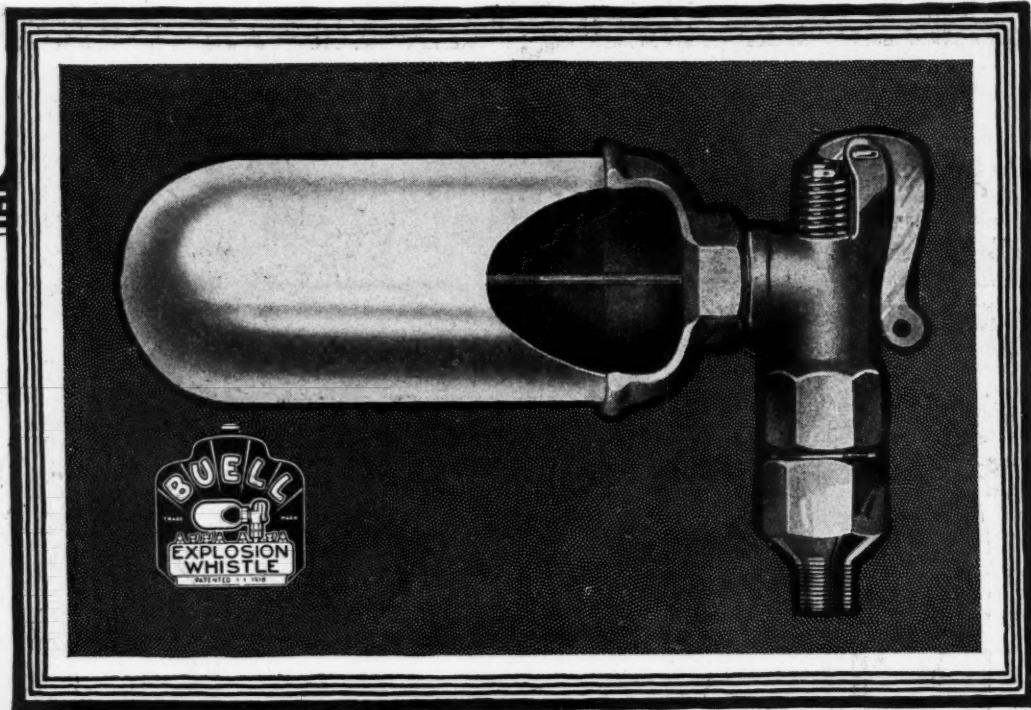
Auto Truck Steel & Wood Body Co., 1315 No. 23rd Street, St. Louis, Mo.

**DAILEY
MOTOR TRUCK
BODIES**

CHICAGO

Dailey 4-in-1 Bodies
Dailey Hand Hoist

Auto truck steel bodies
Hydraulic Hoists of
all types



BUELL

EXPLOSION WHISTLE

THE clear, distinctive *Toot-Toot-Toot* you've been hearing on city street and country road, is the note of the BUELL Explosion Whistle. For no other has the full, pleasing tone; the absolute reliability of action, the element of instant warning that places the BUELL on top as the signal par excellence.

BUELL Explosion Whistles are a decided mechanical success, passing the hardest tests imposed by the engineering departments of **over sixty-two manufacturers** who have adopted them as equipment.

You, too, will approve the BUELL for touring car, limousine or fleet of trucks. Your dealer has them or will get them for you at once.

Two models, chime and single tone, for passenger cars and trucks.

We have many testimonials from truck manufacturers. Copies sent on request.

Manufacturers and Dealers: Write for special proposition


BUELL MANUFACTURING COMPANY


2977-79 Cottage Grove Avenue

Chicago, Illinois



A FAR REACHING TOOT!-TOOT!-TOOT!-OF REAL WARNING





ENDURANCE


Motor Truck Economy is Almost
Wholly a Matter of Maintenance Cost

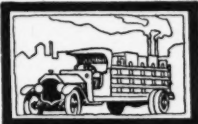

THE mere fact that one truck costs less than another of the same capacity is no proof that the cheaper truck is the most economical purchase.

Find out which truck possesses the greatest endurance and will deliver the most ton-miles per dollar of maintenance and upkeep cost. That is what determines truck economy.

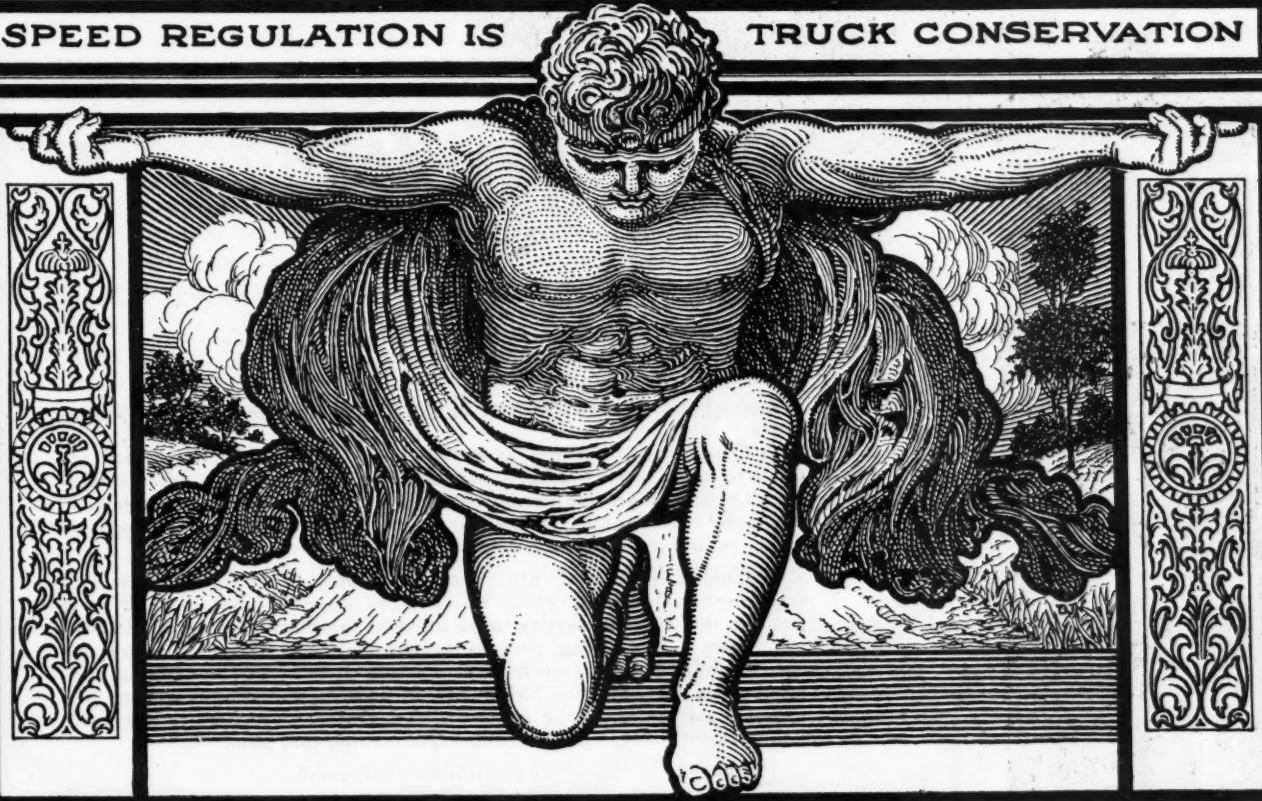
Using an inferior governor in a truck will lessen the cost a few dollars, but such a governor offers but poor protection against collisions, accidents, burnt-out bearings, scored cylinders, broken springs, stripped gears, loosened frame members and other things that put trucks in the repair shop—results of excessive speed.

There are ninety-three truck manufacturers who supply Pierce Governors and thus give some tangible proof that their trucks will endure. For real economy buy those trucks.

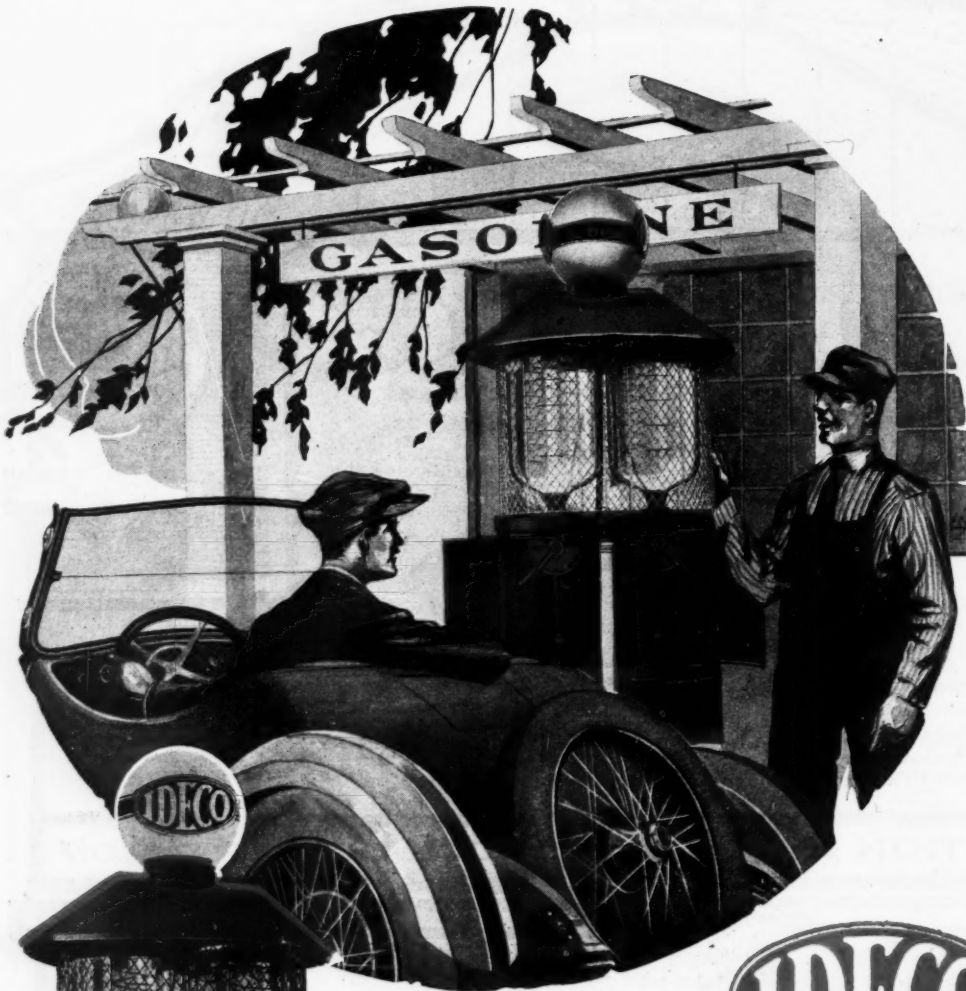


SPEED REGULATION IS TRUCK CONSERVATION



THE PIERCE GOVERNOR COMPANY
"WORLD'S LARGEST GOVERNOR BUILDERS"
ANDERSON - INDIANA



TRADE MARK

**Seeing is Believing—
Believing is Satisfaction—
Essential to Bigger Business—Bigger Profits.**

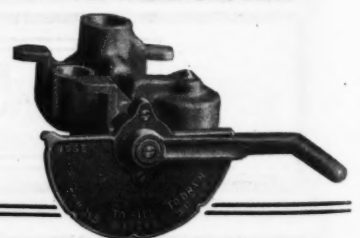
IDECO stations are money makers. They provide a service which appeals to car owners—a service which is visible, assuring full measure. IDECO dealers get the cream of the gasoline business in their territories—and the profits resulting from this greater volume of business make selling gasoline worth while.

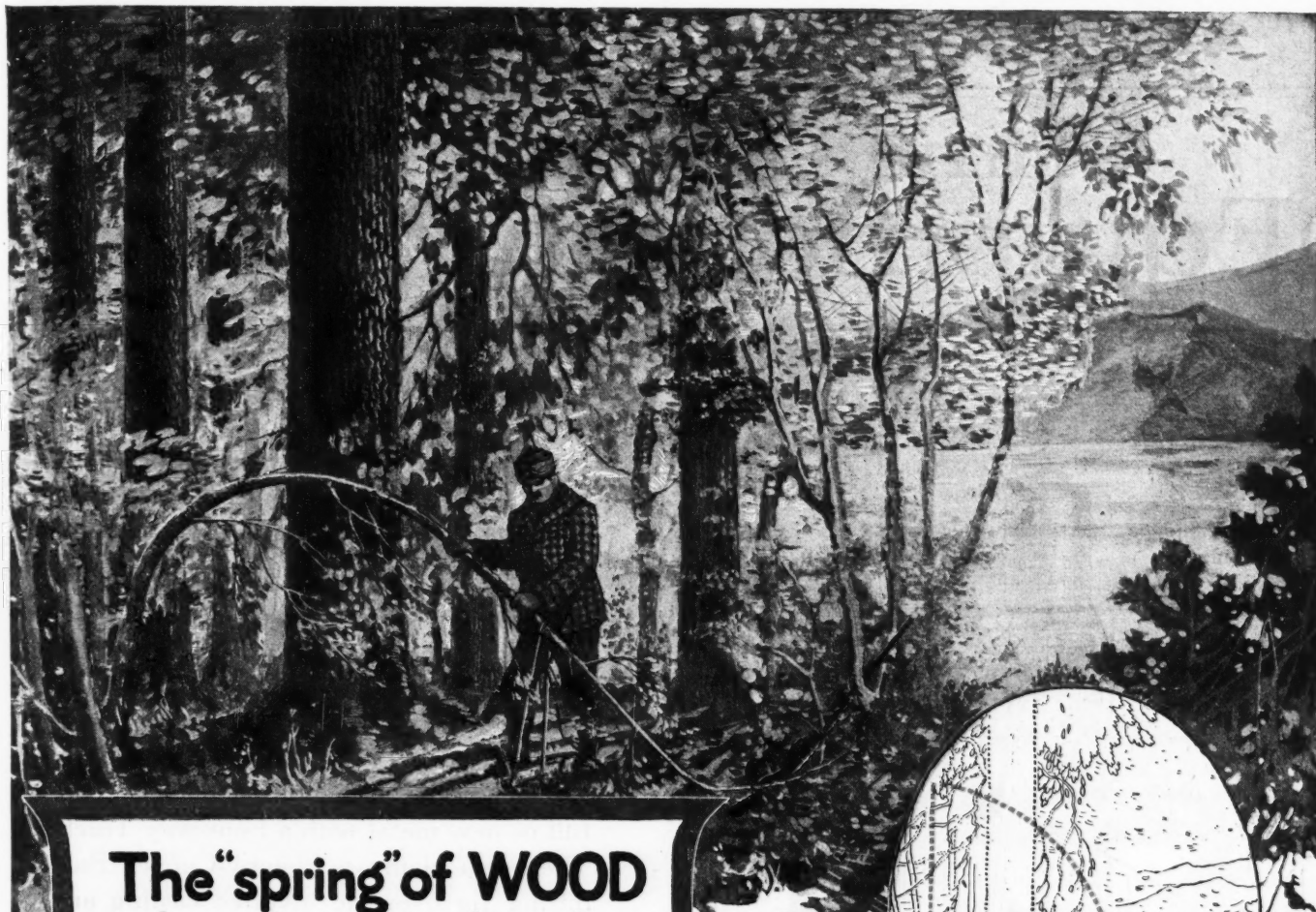
Write for full particulars explaining this simple operating visible service system—a simple unit valve which is so designed that a small lever permits the 5 gallon bottles to be filled to the brim in open view of the purchaser. The filling process is automatically stopped before the bottle is full. A slight movement of the lever releases the gasoline from the bottles through the filling hose. This is a vacuum system, and requires no effort on the part of the operator. The twin bottles give you two stations in one, insuring rapid service that pays.

Full particulars on request.

IDECO
INCORPORATED
Manufacturers of
GARAGE EQUIPMENT
Springfield, Ill., U. S. A.

The Wonder Unit Valve





The "spring" of WOOD absorbs the shocks

The springy yet strong hickory trap of the hunter has a lesson for the owner of passenger car or truck.

WOOD has all the "spring" and "give" so necessary in wheel construction. WOOD Wheels absorb the full force of strain or shock, protecting the mechanical parts of the vehicle. This tremendously decreases the natural wear.

There are no undetectable flaws in WOOD Wheels, for any defect in WOOD is easily found before it is made into a wheel.

WOOD Wheels are the general choice of experienced passenger car and truck users—they combine strength with resiliency—they are safe.

AUTOMOTIVE WOOD WHEEL
MANUFACTURERS' ASSOCIATION
105 West Monroe Street Chicago, Ill.



NOTE THE
WOOD WHEELS
EVERYWHERE

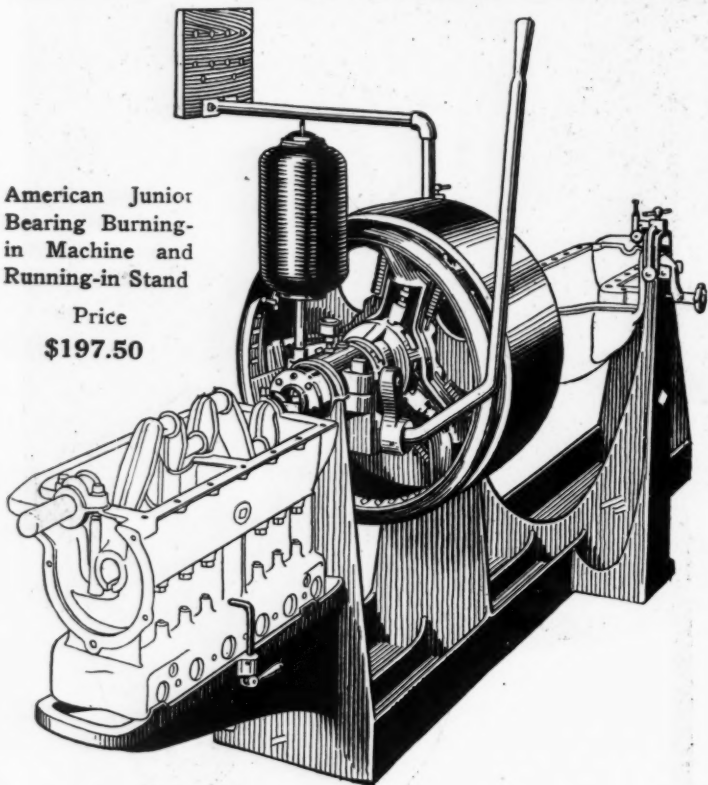
WOOD WHEELS

for MOTOR VEHICLES

Time - Saving and Equipment for Ford

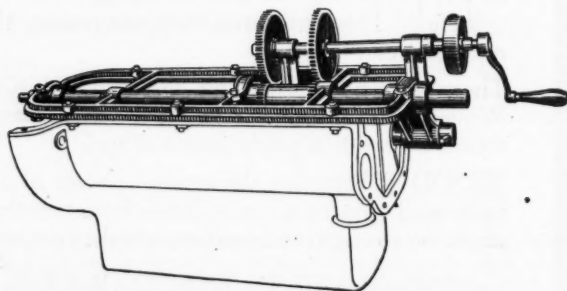
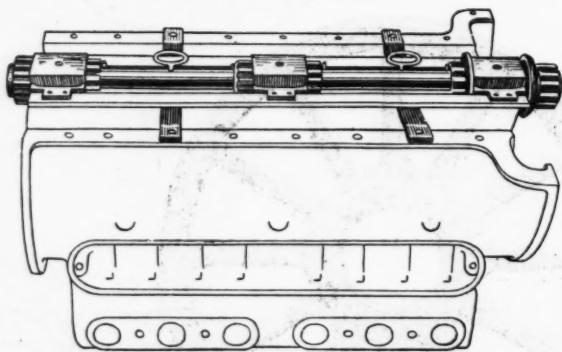
American Junior
Bearing Burning-
in Machine and
Running-in Stand

Price
\$197.50



GROSS receipts from Ford repair work are attractive. But do your labor costs eat them up? They will, unless you stop every waste. Every time you finish bearings by hand, or run-in motors on the road you waste money.

For nearly every operation in repairing a Ford car or Fordson tractor there is a special tool or machine sold under "The Fairbanks Company O.K." New crankshaft bearings, for instance—first you clean out the old babbitt and melt a pot full of new metal with a Four-way Torch. Then you clamp a Hempy-Cooper Babbitting Jig over the inverted casting and pour the three new bearings. Replace the jig with a Hempy-Cooper boring machine, put new caps on the bearings, and in one operation bore all three in perfect alignment.



Hempy-Cooper Bearing Boring Machine and Re-Babbitting Jig for Crankshaft Bearings. Prices: \$125.00 for Fords; \$150.00 for Fordsons

The
FAIRBANKS
Company

Sole Distributors for The Service Station Equipment Company, The Hempy-Cooper Manufacturing Company, The Petterson Engineering & Manufacturing Company, The Grootken Pump Company, and other manufacturers of garage equipment.



MILL, MINE AND RAILWAY SUPPLIES SCALES VALVES POWER TRANSMISSION MACHINE TOOLS

Profit - Making Service Stations

No need to hunt for that old scraping tool. Clamp the cylinder block on an American Bearing Burning-in Machine, put the crankshaft in place, screw the caps down tight without oil. Throw in the clutch and the hard alloy-steel shaft turns in the softer babbitt metal, forcing it away from the high spots into the "lows" and putting a hard glaze on 100 percent of the contact area. Time, half an hour, as against 5 to 7 hours by hand to get a 65 percent surface. The assembled motor is limbered-up on the other end of the same machine.

You can't keep up with rising wages unless you handle more jobs with the same men.

Give your men up-to-date tools; they will give you more work and more respect. Result—better service to your patrons, more repair jobs, larger profits.

You can start with a moderate investment—write for Catalogue 8 and find out.

THE FAIRBANKS COMPANY

Administrative Offices—NEW YORK

BRANCH HOUSES

Albany
Baltimore
Birmingham
Boston
Bridgeport
Buffalo

Chicago
Detroit
Hartford
Newark
New Orleans

New York
Paterson
Philadelphia
Pittsburgh
Providence

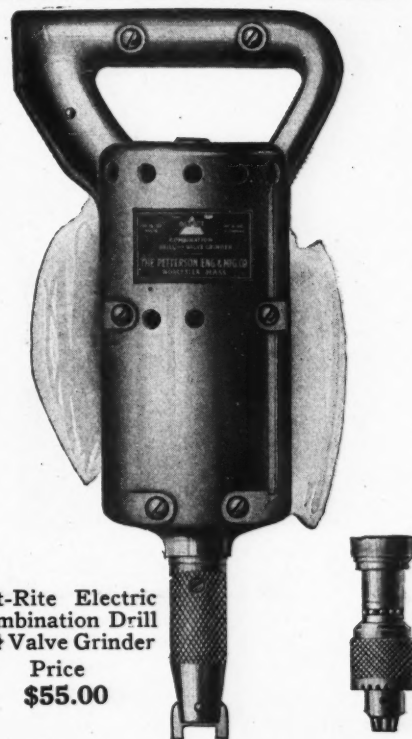
Rochester
Scranton
St. Louis
Syracuse
Utica
Washington

Havana, Cuba
London, England
Birmingham, Eng.
Glasgow, Scotland
Paris, France

MOTOR TESTERS

Bearing Burning-in Machine for Ford and Fordsons
Motor Test Stands
Engine and Axle Stands
Bearing Boring Machines and Re-babbitting Jigs
Cylinder Reboring Machines for Fords and Fordsons
Straightening Presses
Arbor Presses
Air Compressors
Power Grinders
Transmission Reaming Machines
Special Ford Reamers
Rear Axle Sleeve Pullers
Radiator Test Plugs
Piston Clamps
Connecting Rod Straightening Jigs
Bench Motor Clamps
Transmission Drum Clamps
Rear Axle Pinion Gear Presses
Pinion Gear Pullers
Piston Bushing Reamers
Crank and Cam Shaft Testing Machines
Emergency Wheel Clamps
Wheel Pullers
Valve Port Renewing Tools
Bushings Drivers
Turning Bars
Speed and L Wrenches
Special Jacks
Rim Tools
Combination Electric Drills and Valve Grinders
Visible Measuring Gasoline Pumps
Special Ford and Fordson Tools and Machines

[All this equipment is
guaranteed by
"The Fairbanks Company O.K."]



Bilt-Rite Electric
Combination Drill
and Valve Grinder

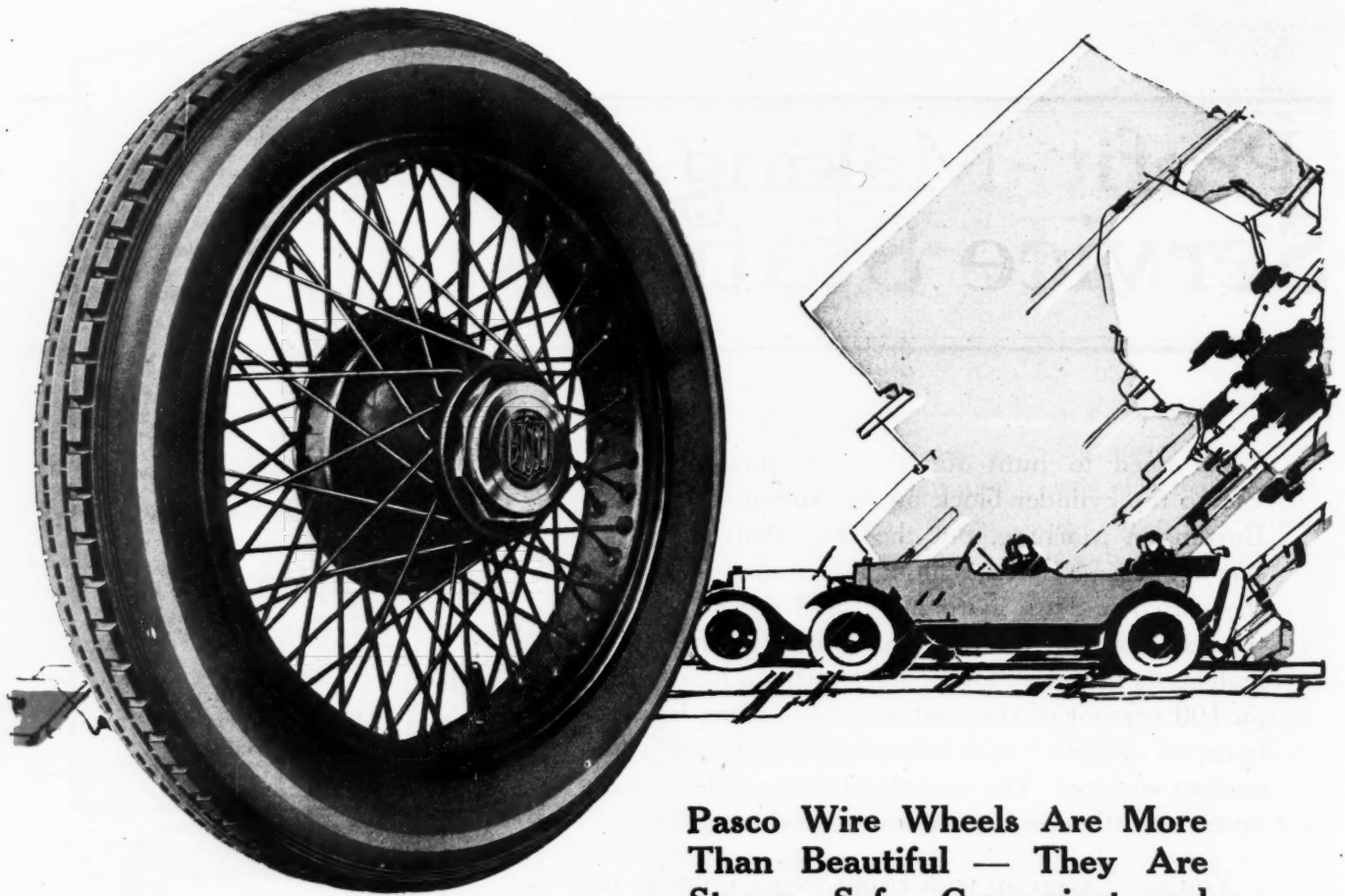
Price
\$55.00

The
FAIRBANKS
Company

Sole Distributors for The Service Station Equipment Company, The Hempy-Cooper Manufacturing Company, The Peterson Engineering & Manufacturing Company, The Groetken Pump Company and other manufacturers of garage equipment.



TRUCKS AND WHEELBARROWS ENGINES AND PUMPS AUTOMOBILE AND SERVICE STATION EQUIPMENT



Pasco Wire Wheels Are More Than Beautiful — They Are Strong, Safe, Convenient and Economical.

The large demand for Pasco Wire Wheels is based chiefly on their beauty and quality. Car manufacturers, dealers and motorists in increasing numbers are showing their appreciation of the remarkably handsome appearance of Pasco equipped cars.

Beauty and quality, however, are not the only advantages of Pasco equipment. It is well not to lose sight of the numerous exclusive mechanical features which give Pasco Wire Wheels their exceptional strength, safety, convenience and economy.

It is well to remember, too, that Pasco Wire Wheels can be interchanged with wood wheels without sacrificing the standard 56-inch tread.

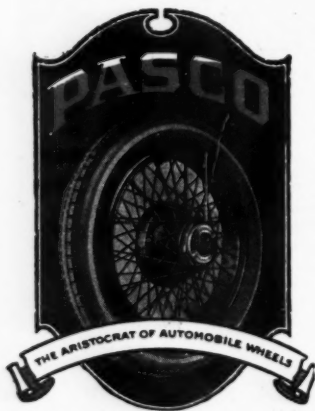
It will pay you to know about Pasco Wire Wheels.

National Wire Wheel Works, Inc.

General Sales Offices:

416-417 Book Bldg., Detroit, Mich.

Plant No. 1, Geneva, N. Y. Plant No. 2, Hagerstown, Md.
Montreal Canada: The Northern Electric Co., Ltd.

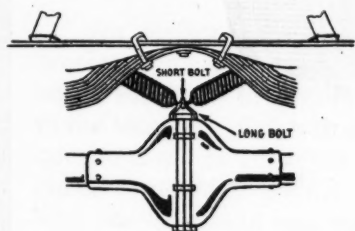


PASCO WIRE WHEELS



A Shock Absorber A Tire and Bead Spreader A Sprayer Cleaner

Each one a leader and each one backed by all the resources of the Nemours Trading Corporation. A shock absorber easy to install, efficient in operation, and low in price. A tire and bead spreader for the tremendously stiff beads of any size tire. A spray cleaner which cleans a car in fifteen minutes.



VICTORY
SHOCK ABSORBERS
FOR FORD CARS
PATENTED MAY 13, 1919. NO. 1303816
\$2.50

Victory Shock Absorbers eliminate excessive spring recoil, vibration and side-sway in the Ford. Applied in fifteen minutes without any drilling or fitting. As easy to sell as they are to apply.



WOODWORTH
TIRE AND BEAD SPREADER

Passenger Car Size \$1.50. Truck Size \$5.00.
Woodworth Tire and Bead Spreader—as useful for the car owner, chauffeur, and motor truck driver as it is for the professional repair man. In the truck size, its double-lever arrangement will spread the toughest, hardest, weightiest tire made.



WONDER-MIST
35¢ to \$3.00
½ PINTS to GALLONS

Wonder-Mist, the original sprayer polish, appeals to the owner of every car, large or small. Cleans the largest car in fifteen minutes. Toughens and improves the finish. Contains no acid, alkali, grease or wax.

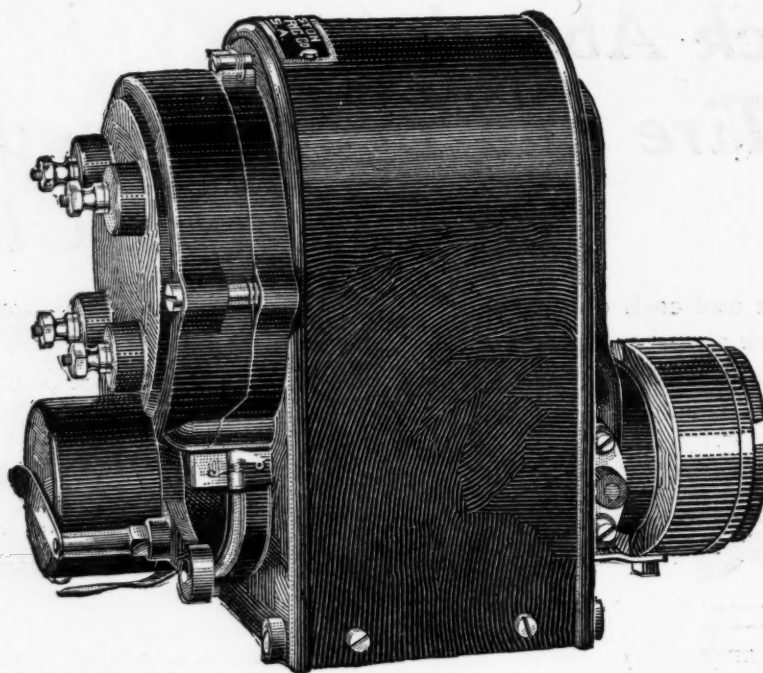
Our other well-known products are the E. Z. Fill Grease Gun, McCulloch Timer and King Crank Holder for Ford Cars.

These products are all so well known that your own jobber undoubtedly carries them. If not write us and we will see that you are supplied.

NEMOURS TRADING CORP.

151 Fifth Avenue
New York, N. Y.





A more dependable magneto, with a hotter spark—a magneto that enables you to get that last atom of power from your fuel—a magneto that means long service, a magneto with a true automatic impulse starter—that is the time-tested Kingston.

KINGSTON MAGNETOS

THE KOKOMO ELECTRIC CO., Kokomo, Indiana, U. S. A.

Branches: New York City, 1733 Broadway; Chicago, 1430 Michigan Ave.; Detroit, 870 Woodward Avenue; Los Angeles, 501 W. Pico Street; Boston, 15 Jersey Street

A Complete Outfit

Perhaps your establishment demands a compressor outfit of peculiar arrangement—possibly no assembled machine would conveniently fit the available space or meet other requirements. If this is your problem, the Brunner line includes various items from which you can select the proper apparatus and set it up to meet the conditions. Either belt driven or motor driven compressor models are offered—also a complete line of valves and fittings.

For instance, the No. 6 Outfit:—A No. 42 compressor with proper tank, gauge, hose, valves, etc., all boxed and ready to install in the manner best adapted to the location. Full instructions are furnished and any questions will be answered by Brunner engineers. This outfit or another similar Brunner outfit, may be just what you have been seeking.

Consult your jobber or write us giving full details of your air service problem.

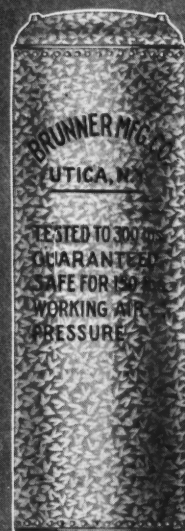
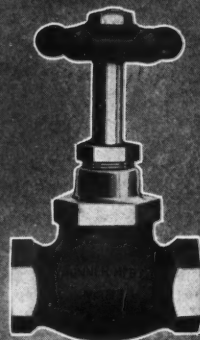
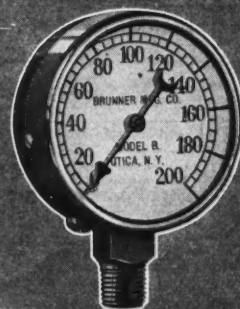
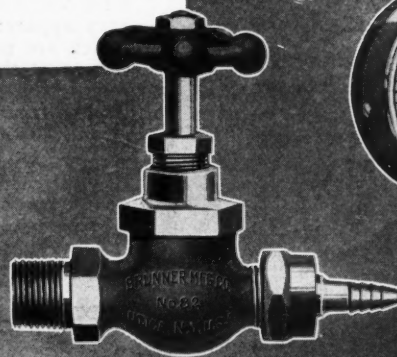
Brunner Manufacturing Co.

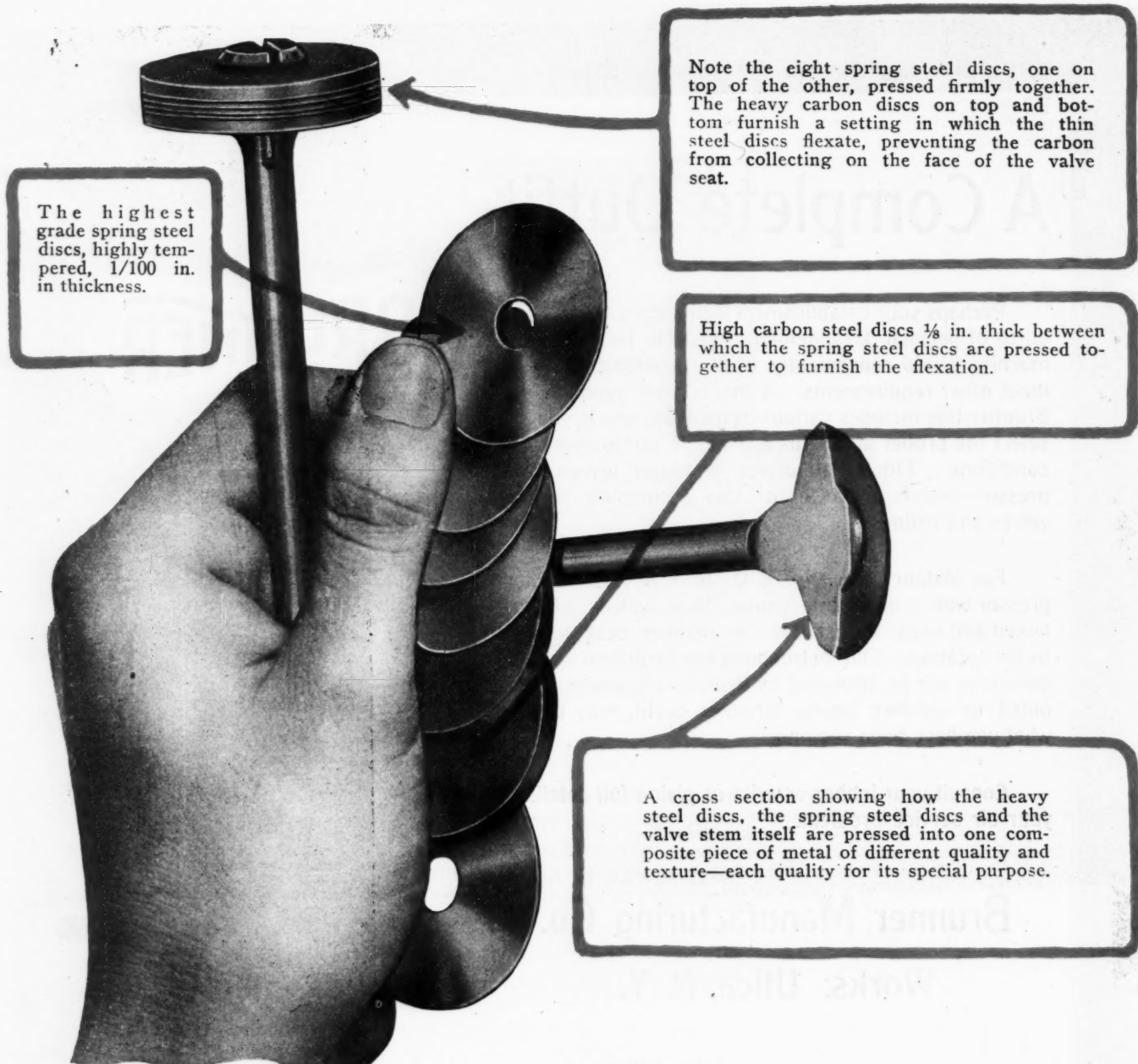
Works: Utica, N. Y.

Sales Offices:

UTICA, N. Y.

CINCINNATI, O.





FLEXEDGE DISTRIBUTORS
 Motor Car Supply Co. of Chicago, 1451-
 3-5 Michigan Ave., Chicago, Illinois.
 Federal Appliance Corp., 1966 Broad-
 way, New York City.
 Joseph D. Tripp, 909 S. Grand Ave.,
 Los Angeles, Cal.
 Reinhard Bros., Inc., Minneapolis, Minn.
 "Kant Break" Spark Plug Co., 330
 Madison Ave., Memphis, Tenn.
 Repass Automobile Co. Waterloo, Iowa.
 United Motor Company, Houston, Tex.

	FLEXEDGE PRICES	Each
Ford	\$0.50
Chevrolet75
Buick D44	2.00
Buick D45	2.00
Buick D35	1.25
Oakland Six	1.25
Franklin Model B	2.00
Saxon Six	1.25
Elgin Six	1.25
Grant Six	1.25
Oldsmobile 37	1.25
Oldsmobile 45	1.25

This Is the Construction of **FLEXEDGE VALVES**—valves that eliminate the necessity of valve grinding

FLEXEDGE construction is simple—the merits of the principle involved are very apparent. The whole principle is merely a flexation of the paper-thin discs which are pressed together under a tremendous pressure. These discs are rigid except at the outer edges where the flexation takes place. This flexation is so minute that it could hardly be called a vibration, yet sufficient to remove the tiny flecks of carbon which collect after each explosion, and soon build up into dangerous pitting deposits.

Dealers—Send for a test pair of FLEXEDGE VALVES. Make a test on one of your own cars. It will pay you to give your jobber a trial order. Every car owner in your territory is an interested prospect.

JOBBERs—Write for facts concerning this big seller.



SELF-SEATING VALVE CO.

706-B Townsend Street
 Chicago



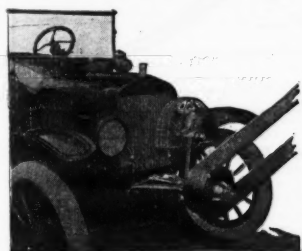
DEALERS—FARMERS

Make the Whole Farm Go On the Power of a Ford

Send the Coupon for Literature and Complete Details Today

Figure for Yourself the Profits From Every

Plus a Ford
It Costs Less Than a 14
H. P. Portable Gasoline
Engine Costs Alone



McGill
AUTOPOWER
FULLY GUARANTEED ATTACHMENT FOR *Ford* CARS



Off or On in 3 Minutes
After the First Installation.
Won't Disfigure the Car

Open Up a Big New Business for Dealers

Every farmer needs power on his farm. He needs an automobile in which to go to town and carry produce. When he can combine the two for less than the cost of a 14 h. p. portable gasoline engine he is on the job to do it.

That's just what MCGILL AUTOPOWER for Ford cars does for farmers who use it. Without disfiguring the car in any way—or even showing when the McGill power plant is off—the MCGILL AUTOPOWER will satisfactorily operate at required speeds, such machines as Ensilage Cutter (any make), Corn Husker, Feed Grinder, Corn Sheller, Small Thresher, Wood

Saw, Pumps (all kinds), Hay Press, Root Pulper, Fanning Mill, Roller Grinder, Concrete Mixer, Road Crusher, Cider Press, Churn, Washing Machine, Milking Machine, etc.

It takes its power direct from the crankshaft of the motor, insuring no loss of power and no wear and tear on the car. Equipped with automatic governor operating on the carburetor, which maintains a constant speed under varying loads. Friction clutch permits motor being cranked before throwing in the load. Auxiliary fan keeps the motor cool under all weather conditions.

Makes New Profits for Dealers Makes the Farmer's Farm Pay More

Dealers and farmers alike have just one question to answer when they consider handling or buying MCGILL AUTOPOWER for Fords—are more profits worth while?

Every dealer who has ever represented MCGILL AUTOPOWER has made good. Every farmer who has used it has built up profits from the start.

Dealers: MCGILL AUTOPOWER is the biggest seller you can hope for. Farmers: The greatest labor saver you can find.

Knight Metal Products Co.

259 East Willis Ave., Detroit, Mich.

Mail the Coupon Now for full Information

KNIGHT METAL PRODUCTS CO.,

259 East Willis Ave., Detroit, Mich.

Gentlemen:

Send me immediately complete information and free illustrated literature concerning MCGILL AUTOPOWER for Ford cars.

Name

Address

Dealers' check here []

Farmers' check here []

A two-cylinder tractor with a slow-speed motor outperforms them all

Hart-Parr 30, having such tremendous power for three plows, handles its load very easily, hence without strain, and consequently will have long life.

If tractors were sold by horsepower developed, the Hart-Parr 30 would be worth from one-third to three times more than any other three-plow tractor in the tests.

The Hart-Parr 30 that made this wonderful record at the Ohio tests is now being used by the Agricultural Engineering Department of the Ohio State University.

DEALERS—The Hart-Parr 30 will enable you to get the bulk of the tractor business in your territory in the face of any competition.

Write for catalog and proposition today.

HART-PARR COMPANY

Founders of the Tractor Industry

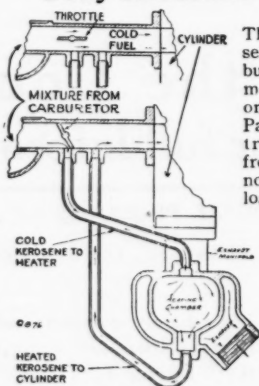
514 Lawler Street

Charles City, Iowa

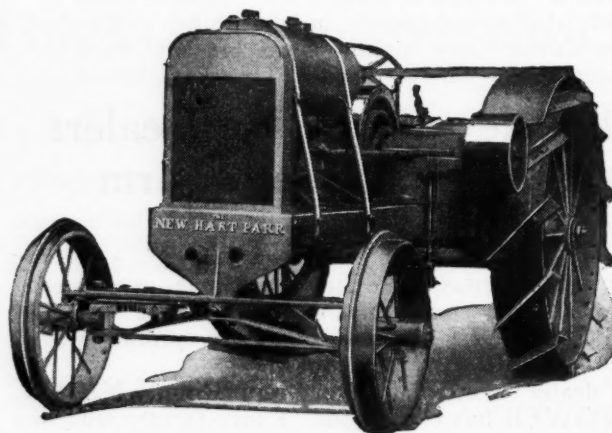
Specifications

Power—Pulls three plows—30 H.P. on belt.
Motor—2-cylinder twin, 4 cycle.
Valve in head. 750 R. P. M.
Tractor Frame—Cast steel, one piece. No bend, no twist.
Carburetor—Dray kerosene shunt.
Bearings—S. K. F. Ball and Hyatt Roller.
Speeds—Two forward; one reverse.
Transmission—Selective sliding gear.
Cooling Device—Honeycomb radiator—shaft-driven pump and fan.
Lubrication—Fresh oil, force feed.
Weight—5158 lbs.
Price—\$1,395 f. o. b. factory.

Dray Kerosene Shunt—



The Dray Kerosene Shunt, a carburetor attachment used only on New Hart-Parrs, enables the tractor to pass from full load to no load, from no load to full load, without delicate adjustment of the carburetor and without throttling or misfiring.



HART-PARR 30

WOW!

HART-PARR 30 Pulls 26.5 Drawbar Horsepower

substantiates 37.5 Belt H. P. record of January test

Ohio tractor tests meet growing demand for demonstrations that prove something

Held by Officials of Ohio State University

Greatest tractor test of all time

How Tests were held

The big Ohio Tractor Tests were held on July 28-29, Aug. 1-2, Aug. 6-7, Aug. 12-13, in four different locations in order to get a variety of conditions.

Only one tractor of each size or model of the same make was entered.

Exhibitors entered the same tractor in all four demonstrations, same being transported from place to place by special train.

No substitution of tractors was allowed. If a breakdown occurred, the tractor was repaired on the field and later removed under its own power.

Each field plowed was divided into lands which were conspicuously numbered. The size of each land allotted the different tractors was proportionate to the number of bottoms pulled. The land was allotted by drawing.

The depth of plowing was announced at each field demonstration.

Drawbar Tests

All tractors entering demonstrations were required to submit to the drawbar tests.

The same plow pulled by each tractor in the demonstration was used in the drawbar tests.

After the dynamometer had been placed in position, one round was allowed for adjustments.

Drawbar tests were made on the new Guley Dynamometer made expressly for the Department of Agricultural Engineering.

The normal plowing test was made during the second round; the maximum drawbar test during the third round.

Fuel was supplied from a common tank for each test.

The tests were of approximately three-fourths hour duration.

The figures selected in the accompanying table are the best tests of each day made by the different tractors.

HART-PARR COMPANY
Founders of the Tractor Industry
514 Lawler St., Charles City, Iowa

Price F.O.B. Fac.	TRACTOR	Rating	No. Plows	No. Cyl.	R. P. M.	Fuel	Foot- ing	Best Test of Day			
								Depth Plowed	Lbs. Pull	Speed	Horse Power
\$1395	Hart-Parr	-30	3-14"	2	750	Ker	Excell	10.25	3220	3.08	26.50
	Wallis	15-25	3-14"	4	850	Gas	Good	9.42	2287	3.25	19.82
	Moline Universal	9-18	2-14"	4	1600	Gas	Good	8.20	2275	3.09	18.72
	Illinois	18-36	4-14"	4	800	Ker	Good	8.12	3125	1.98	16.59
	Aultman-Taylor	15-30	4-14"	4	800	Ker	Excell	8.05	2930	2.05	16.02
	Monarch	18-30	3-14"	4	800	Ker	Fair	8.42	2600	2.29	15.91
	Waterloo Boy	12-25	3-14"	2	750	Ker	Good	7.12	2480	2.39	15.78
	Case	15-27	3-14"	4	950	Ker	Good	8.06	2720	2.13	15.45
	Bates Steel Mule	15-22	3-14"	4	900	Ker	Excell	7.95	2710	2.11	15.25
	Wallis	15-25	3-14"	4	850	Gas	Poor	7.18	1900	3.00	15.20
	Bates Steel Mule	15-22	3-14"	4	900	Ker	Poor	8.91	2455	2.31	15.10
	Aultman-Taylor	15-30	4-14"	4	800	Ker	Poor	7.19	2800	2.05	14.98
	Frick	15-28	3-14"	4	900	Ker	Excell	8.67	2560	2.18	14.92
	Hart-Parr	-30	3-14"	2	750	Ker	Poor	8.08	1510	3.66	14.77
	Illinois	18-36	4-14"	4	800	Ker	Poor	8.02	2480	2.23	14.73
	Monarch	18-30	3-14"	4	800	Ker	Good	8.57	2778	1.99	14.73
	Frick	15-28	3-14"	4	900	Ker	Poor	8.00	2028	2.68	14.52
	Moline Universal	9-18	2-14"	4	1600	Gas	Poor	8.32	1643	3.07	13.45
	Emerson	12-20	3-14"	4	900	Ker	Excell	9.71	3000	1.67	13.42
	Huber	12-25	3-14"	4	1000	Ker	Fair	8.94	2158	2.33	13.40
	Cletrac	12-20	2-14"	4	1250	Ker	Good	9.40	1892	2.65	13.38
	Cletrac	12-20	2-14"	4	1250	Ker	Fair	8.85	1688	2.93	13.19
	Parrett	12-25	3-14"	4	1000	Ker	Good	8.02	1802	2.73	13.11
	J-T	16-30	3-14"	4	1000	Ker	Fair	10.07	2285	2.13	12.99
	J-T	16-30	3-14"	4	1000	Ker	Good	7.62	2038	2.39	12.95
	LaCrosse	12-24	3-14"	2	750	Ker	Fair	8.55	2160	2.23	12.85
	Parrett	12-25	3-14"	4	1000	Ker	Fair	7.66	2074	2.32	12.82
	Huber	12-25	3-14"	4	1000	Ker	Poor	8.25	1818	2.56	12.45
	Wellington	10-20	2-14"	4	1000	Ker	Good	8.60	1584	2.89	12.18
	Waterloo Boy	12-25	3-14"	2	750	Ker	Fair	7.00	1905	2.39	12.13
	Titan	10-20	3-14"	2	500	Ker	Good	7.67	1990	2.28	12.10
	Emerson	12-20	3-14"	4	900	Ker	Poor	7.66	1820	2.44	11.86
	Case	15-27	3-14"	4	950	Ker	Poor	9.08	1995	2.24	11.70
	LaCrosse	12-24	3-14"	2	750	Ker	Good	8.31	2000	2.19	11.65
	LaCrosse	12-24	3-14"	2	750	Ker	Fair	8.70	2080	2.07	11.51
	Avery	12-25	3-14"	2	570	Ker	Good	8.62	2710	1.37	11.29
	LaCrosse	12-24	3-14"	2	750	Ker	Good	7.00	1748	2.33	10.88
	Fordson	10-20	2-14"	4	1000	Ker	Good	7.68	1304	3.09	10.78
	Heider	12-20	3-14"	4	750	Ker	Fair	6.37	1972	2.04	10.76
	Whitney	9-18	2-14"	2	750	Gas	Excell	6.62	1520	2.63	10.66
	Wellington	10-20	2-14"	4	1000	Ker	Poor	8.26	1666	2.22	9.89
	Heider	12-20	3-14"	4	750	Ker	Poor	7.56	1922	1.91	9.81
	Avery	12-25	3-14"	2	570	Ker	Fair	8.02	1403	2.55	9.52
	Case	10-18	2-14"	4	1050	Ker	Poor	8.04	1290	2.70	9.33
	I H C	8-16	2-14"	4	1000	Ker	Good	7.41	1642	2.15	9.31
	Case	10-18	2-14"	4	1050	Ker	Good	7.30	1418	2.43	9.22
	Fordson	10-20	2-14"	4	1000	Ker	Fair	7.75	1320	2.53	8.90
	I H C	8-16	2-14"	4	1000	Ker	Poor	7.68	1600	1.99	8.48
	Reliable	10-20	2-14"	2	600	Ker	Good	8.72	1575	1.91	8.02
	Whitney	9-18	2-14"	2	750	Gas	Poor	6.87	1295	2.31	8.02
	Shelby	9-18	2-14"	4	1100	Gas	Fair	7.95	2100	1.42	7.97
	Titan	10-20	2-14"	2	500	Ker	Poor	7.22	1800	1.59	7.63
	Heider	9-16	2-14"	4	800	Ker	Poor	8.25	1312	2.07	7.26
	Heider	9-16	2-14"	4	800	Ker	Poor	6.92	1266	2.03	6.86
	Shelby	9-18	2-14"	4	1100	Gas	Poor	7.50	1246	2.06	6.83
	Reliable	10-20	2-14"	2	600	Ker	Poor	6.86	1000	1.96	5.20

Data from Official report of Ohio State University.
Fuel data from official cards.

Gilmer

WOVEN ENDLESS BELTS

The Package Idea

Gilmer Woven Endless Fan Belts are packed in attractive "saleshelp" cartons, each containing twenty-five belts of one size to fit a certain group of cars. Group number and name GILMER stenciled on each belt. There's a belt for every car using flat type belts.

The carton plan of stocking belts, originated by Gilmer, has replaced the old style method of carrying belts in bulk with its actual loss and confusion.

Most dealers find it to their interest to carry complete assortments.



"The car builder's choice is good enough for me"

More than 8 out of 10 cars are GILMER equipped

HERE'S a Fan Belt that stays on the job long after ordinary Belts have commenced to slip or stretch or stick or have become unfit for efficient service.

Exhaustive laboratory experiments and hundreds of road tests have proven that the Fan Belt that resists heat, oil and moisture will wear longest and best.

The Gilmer scientific process of treating and weaving Belting made of long staple cotton was one of the most important discoveries made in Belt history.

Thanks to this process, Gilmer Belts completely resist heat, moisture and oil, which means that when in use the character of this Belt never changes from

the moment it is installed until it is completely worn out. It never stretches nor shrinks, never grows hard and slippery or loses its shape.

It never jumps or jerks at the joint, or splice, because there are no joints or splices. Gilmer Fan Belts are woven endless, one continuous strip that permits the Belt to grip the pulley "true and snug" all the way around with never a slip or a jerk.

Follow the judgment of car builders when buying a Fan Belt. They know. Eight out of ten cars being built today are equipped at the factory with Gilmer Belts. If so many car builders, after making hundreds of scientific experiments and road tests, all agree on one make of Belt, the reason is very obvious.

"Carry a Spare"

A Spare Fan Belt is as necessary as a Spare Tire. Make two sales instead of one. Urge your customers to "Carry a Spare."

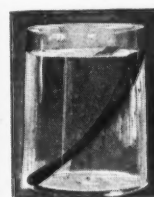
Don't try to judge Fan Belt merit by appearance, weight or feel. Remember, heat and moisture are a Fan Belt's worst enemies. Don't run the risk of impairing the efficiency of your cooling system by using a Belt which might cause serious engine trouble for you.

Insist upon the genuine—Gilmer dependability has no substitute.

L. H. GILMER CO.
Philadelphia, Pa.



THE HEAT TEST
Shows that ordinary belts become stiff and hard from heat—proving that they will slip and disintegrate rapidly when in actual service under the hood. In service Gilmer scientifically treated Belts are unaffected by heat.

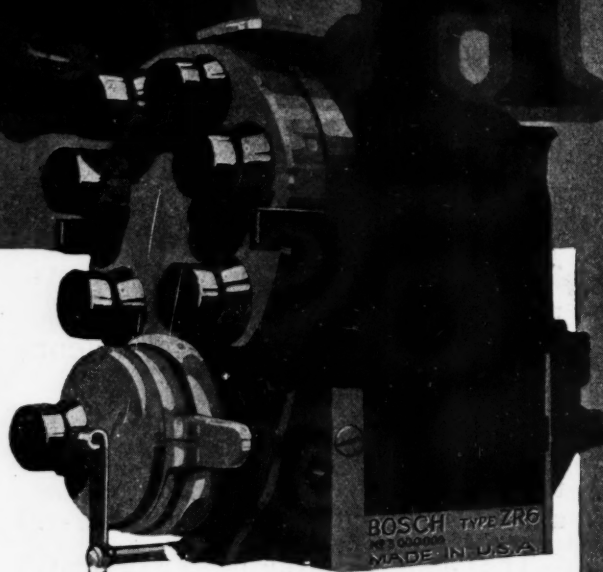


THE WATER TEST
Shows that ordinary belts stretch or shrink when subjected to much oil or moisture—proving that they require constant adjustment when in use. Gilmer Belts are totally unaffected by oil or moisture and can be run continuously in water.



BOSCH

To the Thousandth of the Inch and Second



It is because every part of every Bosch Magneto is made to the thousandth of an inch that Bosch Sparks are accurate to the thousandth of a split second. Any automobile engine will be more powerful, more economical and more dependable when equipt with Bosch Magneto Ignition.

The manufacturer who makes Bosch his standard spends more money in order to produce a better automobile. That standard is reflected by motorist satisfaction and dealer prosperity. Write for descriptive catalog.

Be Satisfied.

Specify Bosch.

AMERICAN BOSCH MAGNETO CORPORATION

Main Office and Works—Springfield, Mass.

Branches—New York, Chicago, Detroit, San Francisco.

More Than 200 Service Stations in Over 200 Cities



AMERICA'S SUPREME IGNITION SYSTEM

MOTOR TRUCKS - TRACTORS - AIRPLANES - MOTOR CARS - MOTOR BOATS - MOTORCYCLES - GAS ENGINES - ETC.



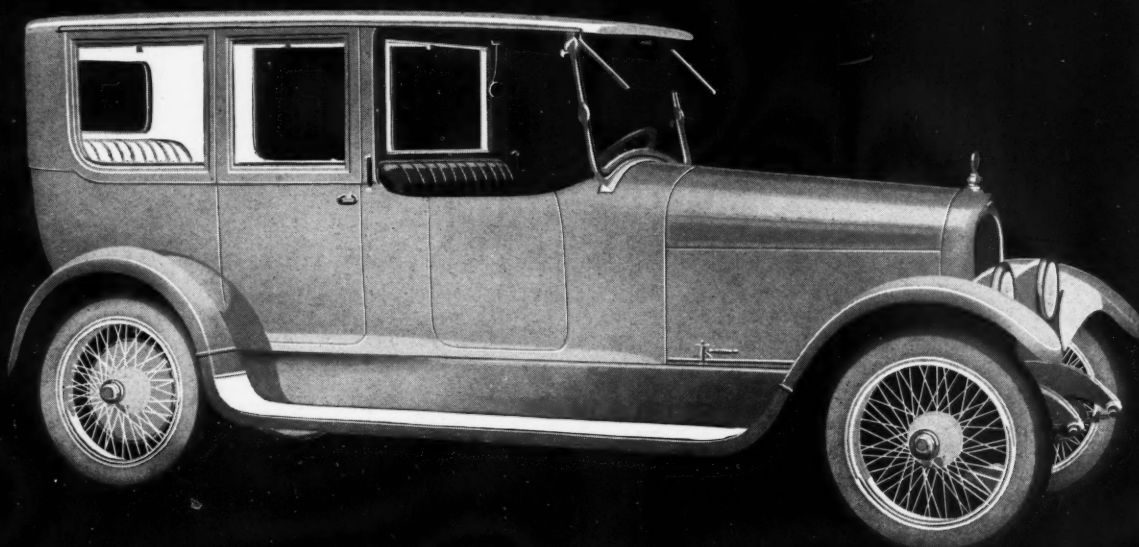
MARMON 34

Below is pictured an exact likeness of the Marmon Limousines sold to the French High Commission for the use of the General Staff. No greater distinction has been conferred on any American car.

NORDYKE & MARMON
COMPANY

Established
1851

Indianapolis
U. S. A.



Years of Progress

FOUNDED in 1851, Nordyke & Marmon Company has progressed and prospered through all the shifting currents of time and trade for sixty-eight years. It has triumphed through periods of depression, through wars and financial panics. It has built up a good will that is outstanding in the automobile world—because the company has ever been faithful to the traditions of the founders. In producing the best article at a fair price no sacrifice should be too great to make.

NORDYKE & MARMON COMPANY

Established 1851

INDIANAPOLIS

Standard Equipment

GABRIEL SNUBBERS

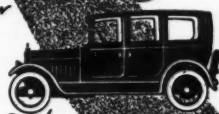
Make Your Car Ride Easier and Last Longer



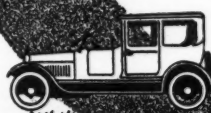
Packard



Pierce-Arrow



Peerless



White



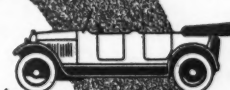
Buick



Studebaker



Kissel Kar



Moline-Knight



Auburn



Essex



Hudson



Chandler



Dodge



Oldsmobile



Hupmobile



Chalmers



Ford Government Ambulance



General Motors Government Ambulance

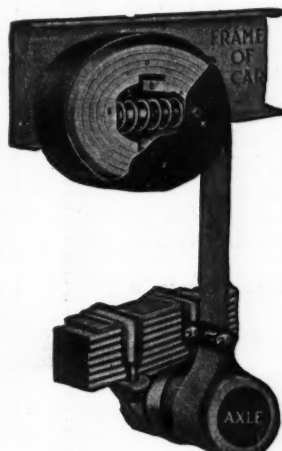


YOUR Car Needs Snubbers

The fact that all these cars are either standard-equipped at the factory with Gabriel Snubbers or have their frames drilled to receive them—is proof conclusive that your car should have Snubbers to make it ride easier and last longer.

GABRIEL MFG. CO.

1415 East 40th St. CLEVELAND, O.



GABRIEL SNUBBERS keep the car from bouncing just as easily as the boy holds the bull—it's the COIL that does the trick.

It PAYS to be a

THE advertising publications are printing long articles telling about the bold, unique and sensible advertising campaign of the Mutual Truck Company.

\$60,000 in BUSINESS papers and several times that amount in local newspapers

Our double-page campaign in TRADE JOURNALS (see miniature reproduction) talks straight business to a MILLION BIG BUSINESS MEN, in their own offices, in papers that they look to for advice in buying all their plant equipment; for a Motor Truck is a piece of plant equipment and is bought as such.

Who are your best "prospects" for a high-quality, heavy-haulage Truck? Aren't they the big manufacturers and wholesalers in your territory?

And the professional Teaming Companies? And the Farmers, Stockraisers, Grain and Produce Men?

These are the men—the big men—that we talk to week-by-week and month-by-month, thru their "Business Bibles;" and the way their inquiries are coming in proves that they are deeply interested in what we have to say about

"America's Greatest Truck"

They are the sort of men who want the very best and have the money to pay for what they buy.

When you become our agent, you will find that we have already created the demand among the Captains of Industry and Trade in your territory.

This campaign uses the 65 leading Trade Papers in the following industries:

Heavy-Haulage Industries Reached by this Campaign

Brick and Clay Products	Men's Clothing Manufacturers
Building Materials	Milk Companies
Candy Manufacturers	Mill Supply Houses
Cement and Concrete	Mining Co.'s—Coal and Metal
City Officials	Newspapers and Publishers
Coal—Wholesale and Retail	Oil Companies
Contractors and Engineers	Oil Jobbers
Chemical Industries	Paint Mfrs. and Jobbers
Creameries and Dairies	Packers
Department Stores	Petroleum Refiners
Electric Light Companies	Piano Dealers and Movers
Express Companies	Potteries
Farmers	Produce Jobbers
Fleet Owners	Road Builders
Flour and Feed Stores	Scrap Iron Dealers
Flour Mills	Ship Builders
Foundries	Ship Chandlers
Furniture Mfrs. and Dealers	Shoe Mfrs. and Wholesalers
Fruit Shippers	Stock Raisers
Gas Companies	Sugar Mills
Grain Dealers	Tanneries
Hides and Leather	Teaming Companies
Highway Commissioners	Telephone Companies
Ice Cream Manufacturers	Textile Industries
Implement Manufacturers	Threshermen
Iron and Steel Manufacturers	Timbermen
Iron and Steel Jobbers	Traffic Managers
Iron and Steel using Industries	Water Works Superintendents
Lumber Dealers	Wholesale Houses
Lumber Mills	Women's Clothing Mfrs.
Machine Shops	Wood Working Industries
Machinery Manufacturers	

"America's Greatest

OUR campaign also includes general business papers for Executives—such as System, Industrial Management, National Banker, Purchasing Agent, Etc. And this list is being added to, week-by-week.



MUTUAL

"America's

An "All Star" Truck

Like an "All-Star" theatrical performance, the MUTUAL TRUCK is an aggregation of units that have won a place and a name for themselves at the very top of the profession.

In making our selection of the units for the MUTUAL, we closed our ears to the noise of mere popular advertising; and, by careful comparison, measurement and test, of the rival makes of engines, clutches, transmissions, universals, frames, axles, radiators, steering gears, magnetos, carburetors, wheels and all other parts; chose the ones that the great majority of the best posted authorities on the "inside" agreed with us were the very ones that could be used for a truck that would date call itself—"America's Greatest Truck."

MUTUAL SUPER SPECIFICATIONS (TWO TON)

America's Greatest Truck Engine

From every standpoint—design, material, construction, extreme care in manufacture and inspection, the Wisconsin Engine is recognized as indisputably America's Greatest Truck Engine.

There are several very good "second best" truck engines on the market, any one of which is good enough for an ordinary truck; but there is only one engine that is good enough for "America's Greatest Truck"—and that engine is the "Wisconsin"—first in gas economy, endurance, reliability and all-round engine efficiency.

And we put into our 2-ton MUTUAL the same 4 x 6 Wisconsin engine that others use in their 3 and 3½-ton trucks.

America's Greatest Truck Governor

The Duplex Company's Duplex (not Simples) is the only one that controls road-speed independent of motor-speed. It makes the driver obey the owner's orders always and everywhere; it is, in fact, an "automatic chauffeur," that adds years of life to the machine by guarding it against abuse. It is vastly more accurate than throttle control; makes a 20% increase in gasoline efficiency by use of a patented "grid" valve instead of the butterfly type. It proportions fuel-feed to suit road conditions, delivers power as needed, and insures a quick get-away. The Duplex delivers more power on hills and bad roads; increases average road speed 20-30% and acts as an automatic safety brake on steep down grades. Incidentally it costs us 2 to 5 times as much as other makes and types.

America's Greatest Truck Clutch

The Hele-Shaw, Universal No. 5, oil-immersed, multiple-disk clutch costs us \$4.00 as much as the next best, and from three to four times as much as clutches used on the majority of trucks. It gives a smooth, silent but positive pick-up; a firm final grip; and saves the engine and entire mechanism (including tires) the ruinous "racking" that cheap clutches cause. You will tolerate no other clutch on any truck you own after you use the Hele-Shaw.



\$300,000 in Local Newspapers

The minute our sales contract is closed with you, we begin a whirlwind local newspaper campaign over your signature, in your own leading newspapers, giving them \$300,000 for the first 1000 trucks we build—a campaign that will make so big a "noise" that Mutual Dealers will soon dominate the whole high-class truck business for their territories.

Backed By a Whole Rich County

Back of the Mutual Truck Company stands the citizenship and the wealth of Sullivan County, Indiana—a county famous for its rich farms, its pedigreed live stock, its 50 operating coal mines, its oil wells, its natural gas, its 14 prosperous Banks and for its HUSTLE. For this is essentially a community enterprise, backed by the wealth and the earnest purpose of a great wealthy county; and our 500 stockholders can command more millions than we shall ever need, to realize their underlying ambition to make Sullivan the home of America's Greatest Truck Company.

MUTUAL Dealer

Truck"—2—3½—5—ton

WE reproduce below, a photograph in miniature of one of the big double page "spreads" that we are running in weekly and monthly Business Papers reaching hundreds of thousands of proprietors and executives of America's heavy-haulage industries.

MUTUAL Greatest Truck" 2-3½-5-ton

America's Greatest Truck Universal

Could it be anything but a Spicer? And we use three Spicer joints in the shaft and a fourth in the universal clutch itself. Here, too, we put into our 2-ton Mutual a size used for 3 and 3½-ton trucks by all other makers who use the Spicer.

America's Greatest Truck Transmission

"Fuller" of course; and their model "G5" selective; with removable plates, to permit attachment of mechanical hoist and tire pump. Four speeds forward and reverse. A simple sturdy, dependable gear-set used by leading high-priced truck makers on their 3 and 3½-ton models.



America's Greatest Truck Axles (Ball Bearings)

To insure the highest efficiency, we adopted the Sheldon Worm Gear Axle—first because both the worm thrust and radial loads are taken by ball bearings, which offer less friction than any other type of bearing. Second—because it is of the semi-floating type, which has the advantages of greater simplicity, less weight, greater carrying capacity, greater resistance to side shocks, lower maintenance cost and greater ease of removing wheels for



inspection. The more deeply versed in scientific automotive engineering a man is, the more emphatic will be his declaration that the Sheldon is America's Greatest Truck Axle.

Sheldon Ball bearing steering knuckle type of Front Axle was adopted as a matter of course.

And These, Too, Are Greatest:

Parish and Bingham pressed steel frame; extra heavy type. Length 224 inches.

Mather Chrome Vanadium Springs.

Smith Metal Wheels for solid tires—regular equipment and not a costly extra.

Dayton Steel Wheels for pneumatic tires.

Goodyear or Firestone Tires; 36 x 4 solid for front wheels and 36 x 8 for rear, or same makes of Pneumatic tires as an option, at an extra cost.

Ross Steering Gear—with 20 inch wheel (not 17-18 inch).

Perfex Radiator, worth a big story in itself.

Bosch Magneto—type ZR4 with impulse starter. Dust proof and water proof.

Stromberg Carburetor; type M.

Bound Brook Oilless Bushings; throughout.

Weather-tite Cab—fit for a King; regular equipment.

Powell Muffler—12 sections. Remarkably silent.

Electric Steel Castings at vital points, where others use Malleables.

25-Gallon Gasoline Tank

Special 2½-gallon Reserve Lubricating Oil Tank. Wheel base—130 inch.

Specifications on the Mutual 3½-ton and 5-ton are equally "Grote."

Buy One "Mutual"

Don't gamble about the price, but take our word for it—on this one purchase—that we give more for the money, in actual cost to us, than you can get in any other truck.

Put your "MUTUAL" into the hardest service you have, and keep a record of its ton-mile performance—all costs included.

Do this, and all your future purchases will be MUTUALS.

We rise or fall on this test, and remember, we have vanity more at stake than you.

MUTUAL TRUCK COMPANY, SULLIVAN, INDIANA, U. S. A.

100 Dealers—10 Trucks Each

or their equivalent will be all that we can take care of between now and spring; so you will have to Act Quickly if you want to cash-in on the most effective truck advertising campaign ever staged; and to have the honor of being selected as the local representative of what is actually

America's Greatest Truck

Come to Sullivan

That's the best way; wire us that you are coming, then come. We are 26 miles due south of Terre Haute in S. W. Indiana, along the Illinois border—on the main line of the C. & E. I. and a "cross" line of the Illinois Central. Also reached by trolley every hour from Terre Haute. You will be our guest while in town—and we'll treat you "white." Before you leave us, you will know we are actually producing America's Greatest Truck, and will be "wild" to get back on the territory with a demonstrator. Telegraph you're coming—then come.

MUTUAL TRUCK COMPANY

Sullivan, Indiana, U. S. A.

Super-Specifications (2 ton)

Wisconsin Engine, four 4 inch cylinders, with 6 inch stroke; developing 36 horse power at 1000 r.p.m. A "3 ton" engine in a 2 ton truck, America's Greatest Truck Engine—in endurance, smooth running, reliability, gas economy.

Hele-Shaw Clutch, Universal No. 5, with multiple discs in oil bath. Costs us three or four times as much as clutches used on most trucks.

Duplex Governor, double control. (Not Simplex, single control) Governs both engine speed and road speed and adds years of life to the truck by preventing its abuse.

Sheldon Rear Axle, Ball bearing, semi-floating type. Less frictional resistance, greater simplicity, greater carrying capacity and lower maintenance cost than any other truck rear axle. We put their 2½ ton size (built for 20% overload) on our 2 ton Mutual—or the same that others use on their 3 ton trucks.

Spicer Universal. Three joints in shaft and the fourth in our universal clutch. We put same size of Spicer Universal into our 2 ton Mutual that you'll find in other 3 ton and 3½ tons trucks.

Fuller Transmission. "G5," selective—Four speeds forward and reverse. Most trucks offer only three speeds. We give you the same Fuller unit on our 2 ton Mutual that other truck makers put into their 3 and 3½ ton machines.

Parish & Bingham Pressed Steel Frame, extra heavy type. Length, 224 inches. Big enough for any 3 ton truck. Wheel base, 150 inches.

Mather Chrome Vanadium Springs, scientifically heat treated; unequaled for lightness, flexibility, endurance.

Smith Metal Wheels for solid tires—regular equipment and not a costly extra. We could buy best quality wood wheels at half the cost.

Dayton Steel Wheels for pneumatic tires.

Goodyear or Firestone Tires, 36x4 solid for front wheels and 36x8 for rear wheels, where other makers supply either 36x7 or 36x4 dual; at a much lower cost.

Westinghouse Starting and Lighting System; regular equipment.

Ross Steering Gear with 20 in. wheel (not 17 or 18 in.)

Perfex Radiator, cast tank type. Most efficient and longest-lived radiator ever built. Our special self-lubricating "floating" spring suspension absolutely insures radiator against road shocks.

Bosch Magneto—ZR4. Dust proof and water proof.

Stromberg Carburetor. Type M, insuring maximum power, low throttle, rapid acceleration, giving highest efficiency from low grade fuels now in use.

Bound Brook Oilless Bushings throughout.

"Weather-tite" Enclosed Cab—fit for a king; regular equipment. Other makers charge from \$150 to \$200 extra for this type of cab.

Powell Muffler with 12 sections, instead of 10 or less used on most other trucks.

Electric Steel Castings, at vital points, where others use malleables.

25 Gallon Gasoline Tank.

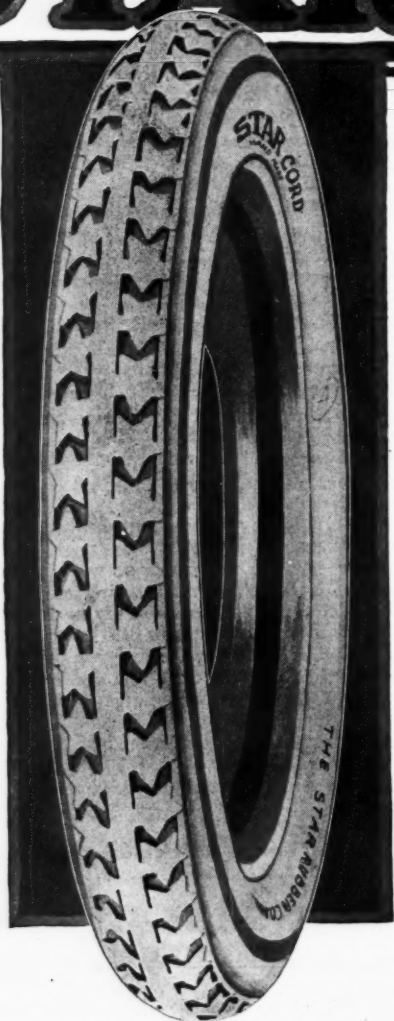
Special 2½ Gallon Reserve Lubricating Oil Tank. An unusually practical and valuable feature.

Some Extras Worth Talking About



Stripped Section of STAR Hand-Made
Extra Ply 5 in. TIRE

STAR HANDMADE EXTRA PLY TIRES



Made In
CORD or FABRIC

IT'S a big help to the man who sells tires to have *actual evidence* of the mileage he is selling in the *tire itself*.

Proof of the splendid mileage of *STAR Hand-Made, Extra Ply TIRES* is there in the cross-section to be seen; and measured; and compared;

- the *extra ply* of fabric adding 20% to 30% more carcass strength.
- extra wide breaker strip—to better distribute and minimize shocks.
- extra thick cushion of pure gum that really "cushions".
- extra heavy side wall strips that protect the carcass from rut cutting and curb chafing.
- the unusual amount of tread rubber accurately compounded to resist wear.

And not an ounce of reclaimed or substitute rubber in a single Star!

These are extras it profits the dealer to talk about and the customer to listen to; they insure a transaction of mutual gain—both seller and buyer profit. Can business be done on a sounder basis?

You should have details of the Star exclusive franchise. Write—or wire.

★THE STAR RUBBER COMPANY★

AKRON'S MASTER TIRE BUILDERS

1063 Crozier St., Akron, Ohio

BRANCHES:

New York: 226 W. 52nd St.
ATLANTA, GA. 328 Peachtree St.
KANSAS CITY, MO. 1922 Grand Ave.



Here is where most Tube Leakage comes

DURAL TUBES are Guaranteed
Against this very Leakage

Leakage at the valve joint is the most common of tube troubles. But you'll never experience it in a Dural Tube. They are guaranteed against valve base leakage. The construction prevents it.

Valve bases of Dural tubes are imbedded hermetically in pure rubber, reinforced with the highest grade of Sea Island Duck instead of the commonly used canvas.

You who are used to having your tubes pumped up every few days, buy a Dural and see for yourself that our guarantee is justified.

All the weaknesses of ordinary tubes are overcome in Dural. It won't leak at the valve joint, it won't leak at the splice, it won't become porous; it won't get out of shape. A liberal overlap is dependable protection against tube pinching. And it's "full size"—A mighty big advantage in cord tires.

—and yet They Cost No More Than Ordinary Tubes

*Read this
Dural
Guarantee
of Quality*

"We will replace free of charge any Dural Antimony Red Tube leaking at the splice, leaking at the valve joint, porous or out of shape, if it is returned to us within one year from date."

Write today for the Dural dealer proposition—it's a liberal offer for a tube that insures satisfied customers.



DURAL TUBES

DURAL RUBBER CORPORATION
FLEMINGTON, NEW JERSEY

Largest Makers of Air-Craft Rubber Parts in America, Dural Woven Brake-Lining and Radiator Hose

The Guarded Opening



Ask
Your
Jobber's
Salesman

BURD HIGH COMPRESSION RING CO., *Rockford, Illinois*

15,000
American Aviators
and 5,000 Canadians
Learned to Fly
in Airplanes Equipped with

BURD
High Compression
PISTON RINGS

The World's Standard of Efficiency

But long before America entered the World War, thousands of British and French Aviators used Burd-equipped planes.

The rigid Hispano-Suiza Engine tests conclusively demonstrated that Burd High Compression Piston Rings are unequaled—positively unrivaled by any other piston ring.

All Jobbers Sell Them

Ask your jobber or write us for full information, dealers' prices, discounts, etc.

BURD HIGH COMPRESSION RING CO., Rockford, Illinois



Why Acme Leads

THIS story of the McWhorter truck shows why Acme owners have such faith in the Acme, and why dealers everywhere take pride in their Acme connections.

McWhorter's truck is a 2-tonner bought in January 1918, and since then has been operating in freight service continuously. It travels 60 to 120 miles every day. In fact two Acme trucks move a big share of the merchandise and freight to Lewisville, Texas.

The Acme has required comparatively few parts, and there has been no complaint, or regret, as far as fuel consumption and cost of up-keep is concerned.

**When you sell the Acme you sell a truck
that can do anything there is to be done**

Acme performance is assured by the adoption of such proved units like Continental motor, Timken axles, bearings and drive, Borg & Beck clutch, Ross Steering Gear, Cotta Transmission, with gears always in mesh, and all other parts of equal high grade, correctly assembled in a well-balanced truck.

Built in 1, 1½, 2, 3½, and 5-ton models

Write for our dealer proposition and an outline of our big national advertising campaign; also a copy of "Pointers to Profits." Address Dept 136.

*Two-ton ACME owned
by J. S. McWhorter, Dal-
las, giving a good ac-
count of itself in the
gruelling service of the
Texas oil fields.*

*The Seal of
Dependable Performance*



*Trade-Mark Registered
U. S. Patent Office*

ACME MOTOR TRUCK COMPANY, CADILLAC, MICH.

VIOLET RAY

AUTO LENS

LEGAL GLARELESS AND SAFE
THE BLUE LENS WITH BLACK VISOR

*\$3 per pair
Any size*

*West of the Rockies
\$3.50*

*Canada
\$4 per pair*

Here is the new lens that is so rapidly climbing into favor — The Violet Ray.

You can look into it with the light on full, without batting an eye.

Make such a test yourself. Then try the same stunt with any other lens.

The Violet Ray Lens is made of blue glass, and blue absorbs all glare rays.



The Violet Ray gives you a big, **white light on the road.**

The best driving light you ever drove behind.

The light is thrown down and to the sides where you need it.

And the black visor prevents any dangerous upward shafts.

The smart design and color add a dressed-up appearance to the car.

Dealers handling the Violet Ray are glad to acknowledge a change for the better in the lens business. The demand is taxing our factory capacity. Write for our dealer proposition. We also make the More-Lite Len, over a million pairs of which are now in service.

L. E. SMITH GLASS CO.

Mount Pleasant, Pa.



The Spike Test Battery *vs.* A Cold Morning

The Mac-Lar Battery Fuses Steel in a Few Seconds

Demonstrate this fact in your own garage with the "Spike" Test.

Two pliers and two 20-penny spikes are the only tools required. Hold a spike to each of the terminals by means of the pliers. Short circuit the battery by touching the free ends of the spikes. Instantly the spikes turn red. A few seconds more and they are literally burning up.

Our 18 months' written guarantee protects you.

Three advantages, combined exclusively in the Mac-Lar, insure this strength and durability. First, extremely hard plates make for long life. Second, it has 25% extra capacity for the same plate area, and a higher momentary discharge rate than any soft plate battery. Third, its recharging efficiency is unusually high.

Mac-Lar fits 99 automobiles out of every hundred.

It replaces more than 51 combinations and shapes of other batteries.

Four standard models, built in 6 and 12-volt shapes, make possible this universal replacement.

The 6-volt Mac-Lar sells for \$25; the 12-volt for \$36.

The Mac-Lar Master Storage Battery is built complete in our own factory by men with years of experience in the manufacture and merchandising of automobile storage batteries. The Mac-Lar is built for you—A Dependable Replacement Battery.

Your territory may still be open. Our sales plan will appeal to you. Write or wire for our dealer proposition.

MAC-LAR BATTERY COMPANY, INC., Detroit, U. S. A.

MAC-LAR

MASTER STORAGE BATTERY

The Brunswick Policy

Demands We Build the Best

FOR 74 years this truth has guided Brunswick production—highest quality wins greatest success. The corps of experts in our factory has one standing order—to build the best tires possible, regardless of cost.

Every known tire feature has been adopted for Brunswicks. Materials—the choicest we can buy—are tested in our laboratory. The smallest details of workmanship are watched with scrutinizing care.

We guard jealously the cherished reputation of Brunswick products. Each tire must contribute its share of fame to this old name.

Brunswick TIRES

Our selling organization reaches throughout the country. Its magnitude enables us to save on the selling cost. Dealers and motorists benefit by Brunswick service. We will send complete information to dealers on request.

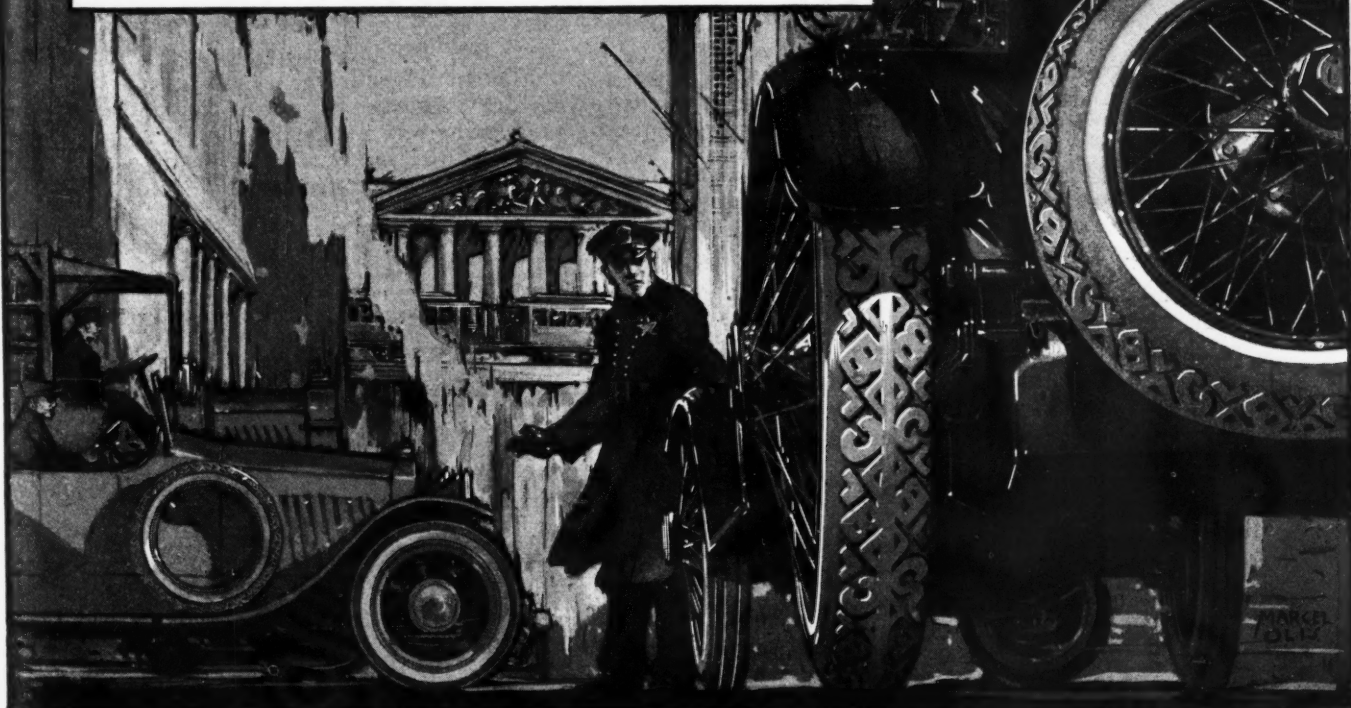
An actual test on your own car with one Brunswick will convince you of its superiority.

The Brunswick-Balke-Collender Company

623-633 South Wabash Ave., Chicago

Branches in the Principal Cities of the United States and Canada

There's a Brunswick Tire for Every Car—Cord, Fabric, Solid Truck





Keeping Him "Sold"

Westinghouse values highly the opinion of the man who RIDES and the man who READS.

So not content with putting the highest quality into starting, lighting and ignition equipment, and furnishing service to the user, Westinghouse does still more.

In addition to its many selling forces that are founded on engineering ability, manufacturing experience and service, Westinghouse has another that is ever at work extending good will for the name "Westinghouse"—the force of advertising.

Westinghouse advertising is put every month before millions of motor car and motor truck owners or prospective buyers—which is one of the reasons why Westinghouse Equipment is so frequently "sold" before the car is sold.

For your own protection and to keep valid the Westinghouse guarantee, use only Westinghouse repair parts, which can be obtained from authorized service stations in all parts of the country.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
Automobile Equipment Department

Branch Sales Offices, Cleveland, Ohio; 1900 Euclid Bldg., Indianapolis, Ind.; City Trust Bldg. Detroit, Mich.; Kresge Bldg. Chicago, Ill.; Conway Bldg.

Automobile Equipment Service Department, 6905 Susquehanna St., E. E., Pittsburgh, Pa.

Works, Newark, N. J., and Springfield, Mass.

Westinghouse

STARTING, LIGHTING & IGNITION EQUIPMENT

TRIÖNE

Trade Mark Reg. U. S. Pat. Off.



The Three-Piece Snap Piston Ring

In heavy structures — and in TRIONE Piston Rings — strength is obtained by the angle beam.

And science demands in a piston ring results that can be obtained only by three-piece construction. The TRIONE angle beam inner ring gives the three-piece ring the strength that makes it practical.

The TRIONE is three snap rings in one. Snap ring simplicity; with effectiveness tripled.

SALES DEPARTMENT

BAILEY-DRAKE CO., Inc.

1120 South Michigan Ave.

CHICAGO, ILLINOIS

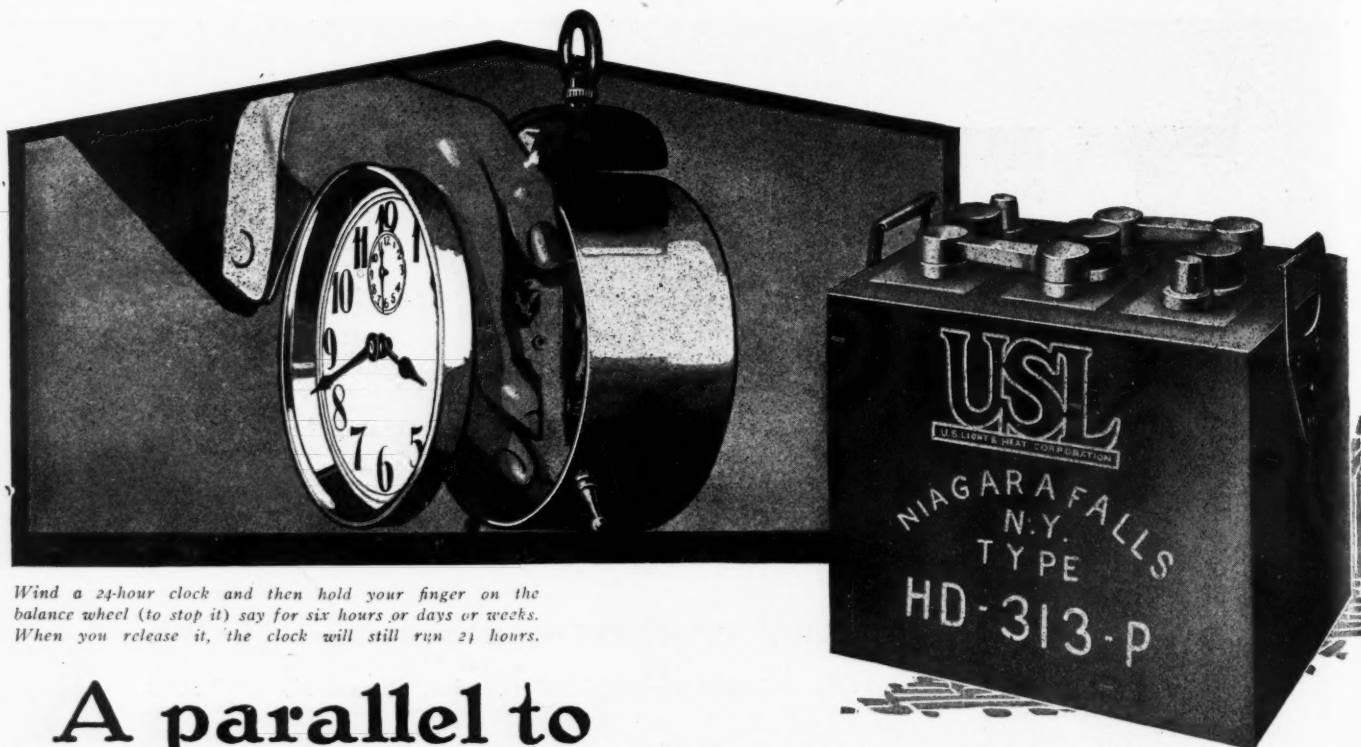
BRANCHES:

New York	-	-	N. Y.
Detroit	-	-	Mich.
Dallas	-	-	Texas
Atlanta	-	-	Ga.
San Francisco	-	-	Cal.
Kansas City	-	-	Mo.
Minneapolis	-	-	Minn.
Seattle	-	-	Wash.



Patent Applied For

Date _____
BAILEY-DRAKE CO., Inc.
 1120 South Michigan Ave. CHICAGO, ILL.
 Gentlemen: Send full information and prices on
 Trione Piston Rings. Also a copy of your booklet.
 Business Name _____
 Street _____
 Town _____
 State _____
 MA-10-2-9



Wind a 24-hour clock and then hold your finger on the balance wheel (to stop it) say for six hours or days or weeks. When you release it, the clock will still run 24 hours.

A parallel to USL "Dry Charged" Storage Batteries



A PARALLEL in that the battery is first fully charged and given an **operating test** at the factory, making it ready to work.

Then the electrolyte is drawn off—and the battery sealed air tight. Now it **can't** work.

In this state, action cannot go on until the battery is unsealed and filled again with electrolyte; then regardless of the lapse of time between the finishing test at the factory and the day it's put in service, the battery delivers every hour of the work built into it at the start.

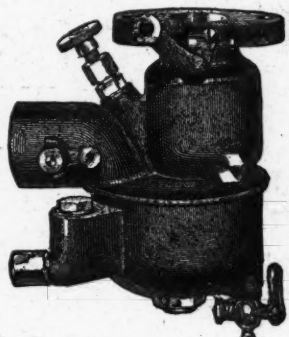
This USL "Dry-Charged" is the only method which makes it possible for the motorist to buy a battery that is perfected and tested at the factory; then held inactive, until ready for use. Not an hour of its service has been used; it's not shelf worn; it's as perfect as though placed on your car and driven away fresh from our testing rooms in Niagara Falls.

Before you buy your next battery let the USL Service man in your town tell you all about USL "Dry-Charged," USL machine-pasted plates and the USL 15-months guaranteed adjustment plan.

U. S. Light & Heat Corporation, Niagara Falls, N. Y.

USL TRADE MARK storage batteries
U S LIGHT & HEAT CORPORATION

FREE Our 50-cent Battery Book that answers every battery question. It's a book you can't afford to be without if you own or drive an automobile. It's free if you mention the make and model of your car.



Made for

MAXWELL

CARS

KINGSTON MAGNETOS



THE KINGSTON

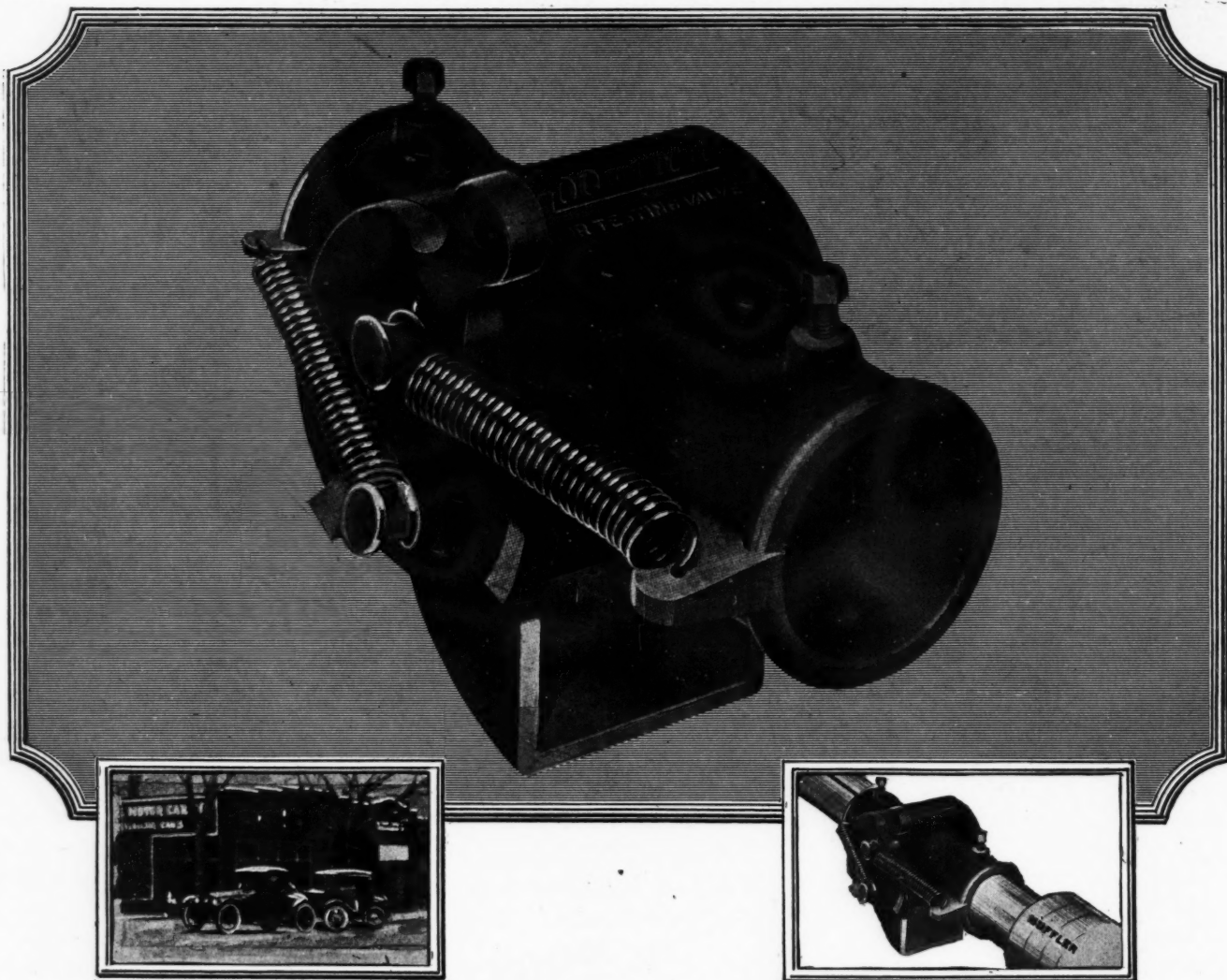
Company, oldest and largest builder of carburetors in America, has perfected a special carburetor for Maxwell cars. The Maxwell Special is simple, staunch, flexible and easily controlled. It will get the last atom of power from your gas. It will operate smoothly, easily, dependably. If you have never known the complete satisfaction in having a carburetor that meets every demand, all the time, in good conditions and in bad, investigate this special Maxwell Kingston. ¶ It has been built for the Maxwell owner. It will solve, once and for all, his carburetor problems. It is backed by the strongest guarantee that we know how to make.

TO MAXWELL OWNERS—The price of this super carburetor, with hot-air stove complete, is \$11.00. If your dealer can't supply you send order to us direct. TO DEALERS—Write at once for special proposition.

BYRNE, KINGSTON & CO., Kokomo, Indiana, U. S. A.

BRANCHES: New York City, 1733 Broadway; Chicago, 1430 Michigan Ave.; Detroit, 870 Woodward Avenue; San Francisco, 1235 Van Ness Avenue; Boston, 15 Jersey Street

ALL GOOD DEALERS CARRY SIZES FOR EVERY CAR



A Missing Engine Is a Glutton for Gas

Be Sure all Cylinders are Working

EVERY car should be tested before it leaves the garage to make sure that all the cylinders are working properly.

Your engine can have no secrets from you when it is equipped with a Goodrich Motor Testing Valve. It distinctly reproduces every pulsation of the engine and instantly reveals any irregularity.

The bell mouth opening of the Goodrich Motor Testing Valve greatly intensifies the sound of each explosion, allows ample space for the expansion of gases and relieves the motor of all back pressure.

It is so simply constructed, so strong, so easily installed, so impervious to hard knocks and adverse conditions—that it is indispensable on all cars whose drivers want to know at all times how their engines are performing.

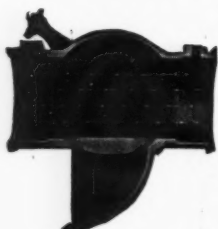
Guaranteed to last the life of the car without sticking, slowing up, carbonizing or giving trouble of any kind.

DEALERS are doing a profitable business with Goodrich Motor Testing Valves. Write for terms and particulars.

*A Size for every Car or Truck.
Ford Size—List Price \$1.75—including Pedal, Pulley
and Cable. Larger sizes at corresponding prices.*

GOODRICH-LENHART MFG. CO.

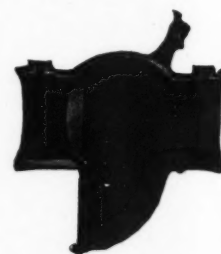
36 Pine Street, Hamburg, Pa.



Showing motor - testing valve closed. Revolving shutter with knife edge absolutely prevents the formation of carbon.

Goodrich

MOTOR TESTING VALVE



Showing motor - testing valve open. Bell shaped mouth produces far louder noise than ordinary cut-out and relieves the motor of all back pressure.



SAVAGE

*The product about which
we have been talking for
the past month is a*

REAR AXLE

*In a series of announce-
ments during the next few
weeks we will outline to
you some of the undesirable
things that Savage axles
will not do.*



SAVAGE ARMS CORPORATION
SHARON, PA.

UTICA

NEW YORK

DETROIT

PHILADELPHIA



SAVAGE

*The product about which
we have been talking for
the past month is a*

REAR AXLE

*In a series of announce-
ments during the next few
weeks we will outline to
you some of the undesirable
things that Savage axles
will not do.*



SAVAGE ARMS CORPORATION
SHARON, PA.

UTICA

NEW YORK

DETROIT

PHILADELPHIA

Completely described in the
Elcar catalog—send for it.

Touring Car



A Few ELCAR Winning Points

Four-cylinder models have powerful long stroke Elcar-Lycoming motor, developing 37½ horsepower at 2,100 r.p.m. Six-cylinder models have Red Seal Continental 3¼ by 4½ inch engine, developing 40 horsepower at 2,100 r.p.m. Sixes and fours are practically the same outside of motors. Two-unit electrical system. 116-inch wheel base. Road clearance, 10½ inches. Full floating rear axle with spiral bevel driving gears. Timken Roller Bearing front and rear. Double universal drive; tubular propeller shaft. Copper cellular radiators. Easy riding, semi-elliptic spring suspension. Roomy, comfortable bodies of beautiful design and durable finish; new "Cathedral Pipe" upholstery. Equipment complete even to motometer on radiator.

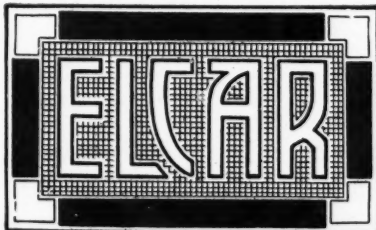
You Too Will Agree That the Elcar Is \$500 Better Value Than Its Price

Compare the Elcar with cars of a similar price. It out-looks, out-values, out-performs, out-classes them all.

Long, sweeping, graceful lines; 116-inch wheelbase; durable, lustrous finish and refinement of appointments; powerful, flexible motor; excellent spring suspension; perfection in mechanical details; render the ELCAR truly a wonder car at its price.

Dealers: If the agency in your territory is one of the few still open, write for particulars.

ELKHART
CARRIAGE
AND
MOTOR
CAR
COMPANY



781
BEARDSLEY
AVENUE
ELKHART
INDIANA

PRICES

4 Cylinder Models

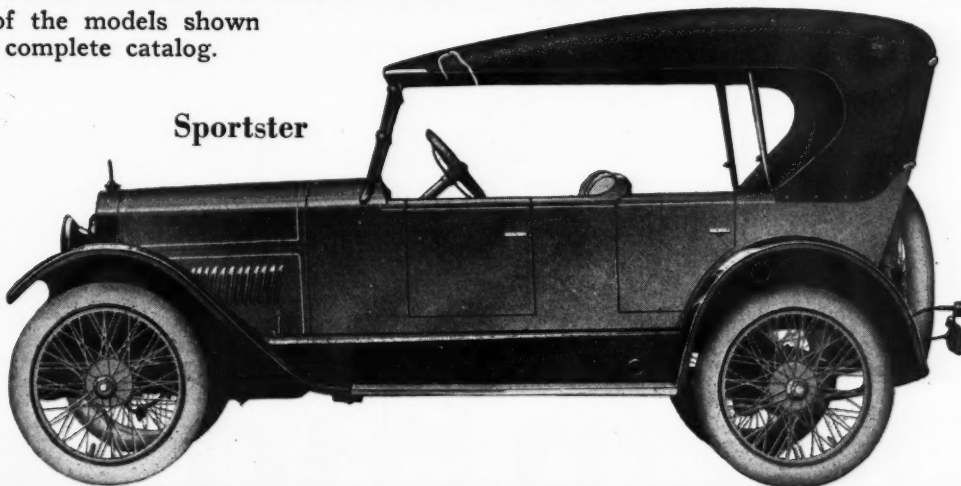
Pass.	
5 Touring	\$1225
5 Roadster....	1225
4 Sportster....	1225
5 Sedan.....	1775

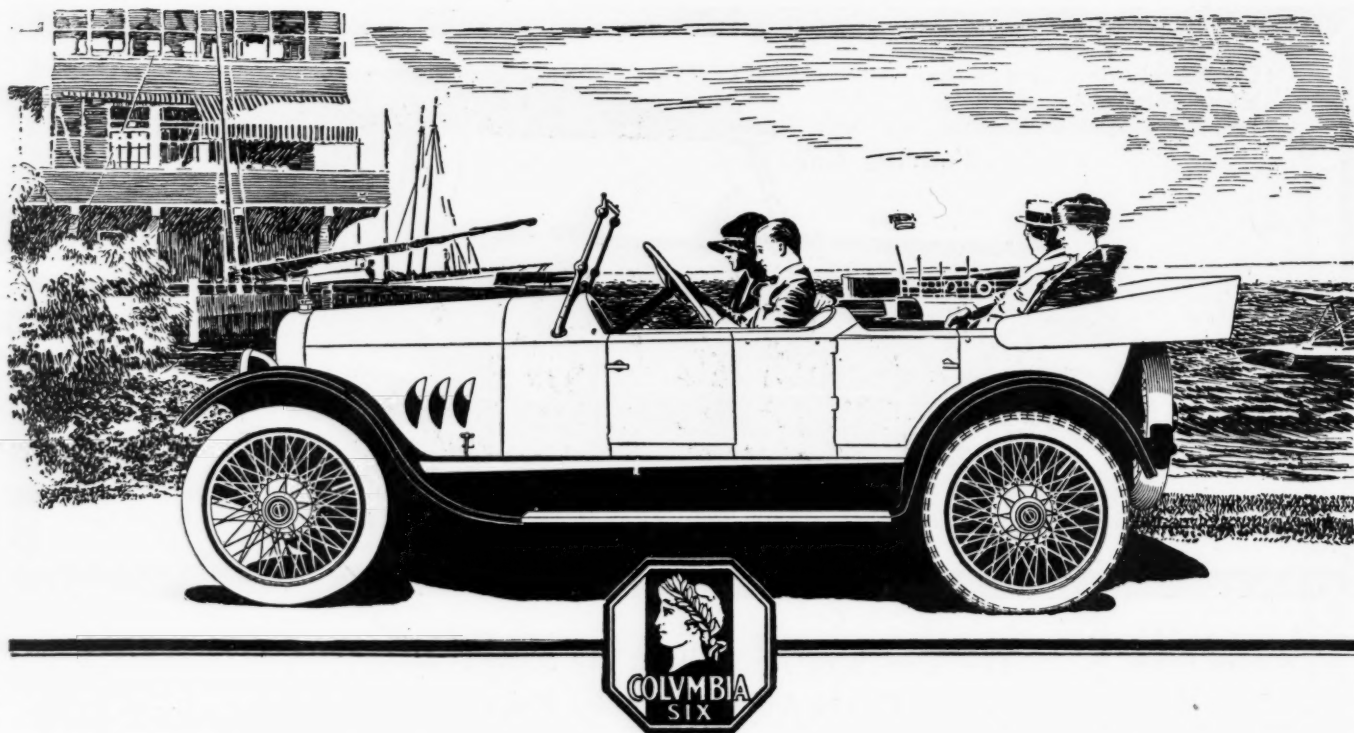
6 Cylinder Models

Pass.	
5 Touring	\$1475
5 Roadster....	1475
4 Sportster ..	1475
5 Sedan.....	1995

One of the models shown
in complete catalog.

Sportster





The Son's Reason

Young men, also, like the Columbia Six.

Some of the best known sportsmen in the country drive it. There's a thorough-bred, high-spirited look of action, sturdiness and power to it. The Columbia Six

appeals to the young man with red blood in his veins.

You will seldom find a car that pleases the young man in every respect and still pleases other members of the family the way the Columbia Six does.

A Columbia Sales contract is a sure way of building a profitable, increasing and permanent business.

Note This—GOOD Units CLEAR THROUGH

Timken Axles—Continental Red Seal Motor—Detroit Pressed Steel Company Frame—Radiator with "Sylphon" Thermostatically Controlled Shutters—Spicer Universal Joints—Borg & Beck Clutch—Durstons Transmission—Detroit Steel Products Company's Springs—Gemmer Steering Gear—Auto Lite Starting & Lighting—Atwater-Kent Ignition—Stromberg Carburetor—Prest-O-Lite Storage Battery—Painting and Trimming by The American Auto Trimming Co.—Pantasote Top—Firestone Tires.

COLUMBIA MOTORS CO.

DETROIT, U.S.A.

Columbia Six

CARRIES THE LOAD

TAKES THE THRUST

IN wheel bearing equipment there's only one best—BOWER.



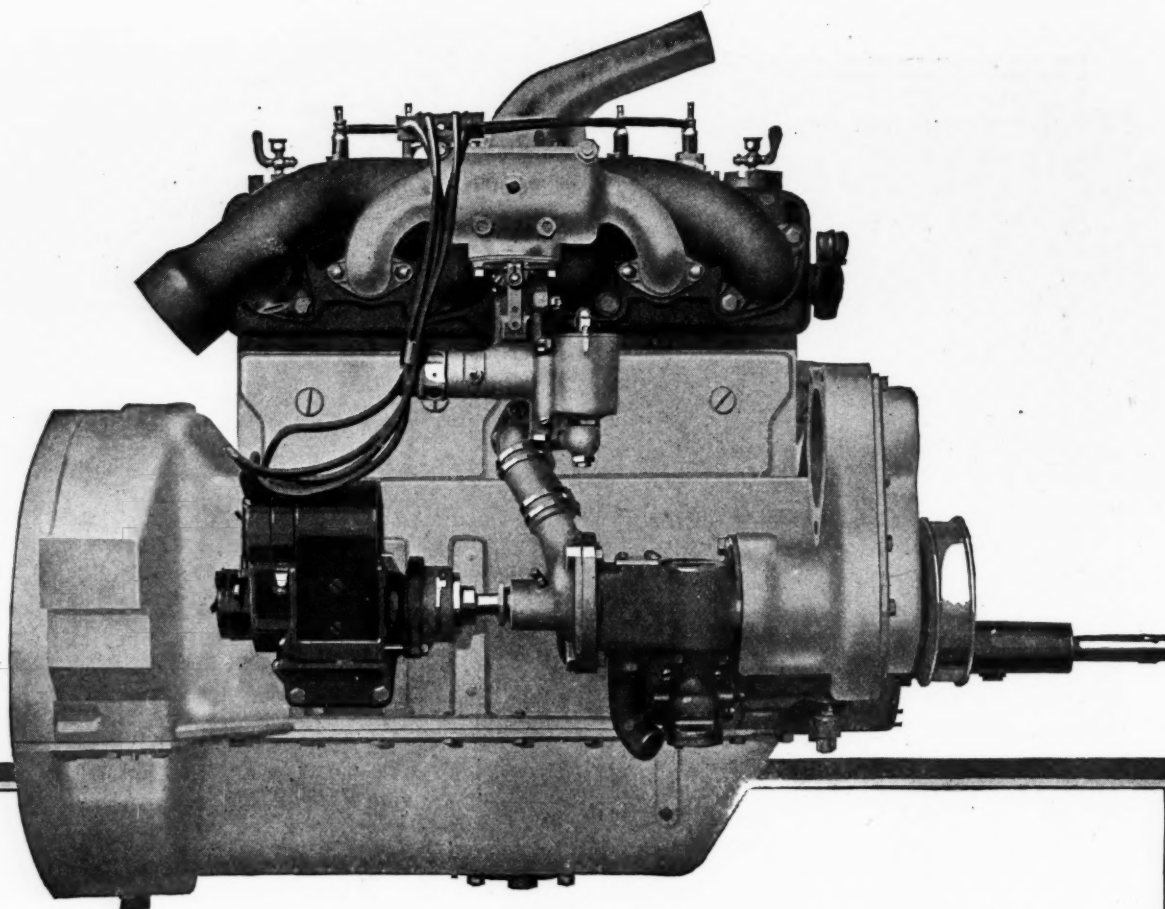
Make child's play
ANYWHERE
of load and thrust

BOWER
ROLLER BEARING CO.
Detroit Michigan

Exclusive Bower Features

Separate bearing surfaces for load and thrust. Parallel raceways. Self-aligning. Never need adjusting. Does not develop end thrust under loads. Will not bind or end-slip.





A Motor of All-Round Efficiency and Quality

The design of the G. B. & S. motor speaks for itself.

It tells a story of simplicity, strength and accessibility.

No motor was ever more carefully developed in every detail.

No motor ever offered the automotive industry develops more *power* for its bore and stroke.

It was our idea to build a *better* motor rather than to exploit new ideas of motor construction.

Hence the G. B. & S. motor *is* better in many obvious ways.

It develops unusual power at moderate speed.

It shows surprising efficiency with low grade fuel.

It features new standards of simplicity, accessibility and adaptability.

It features moderate weight—425 pounds complete.

It features large bearings, heavy crankshaft, extra strength in every detail.

In every way it is an unusually fine motor.

Write for the handsome new catalogue and further information.

Golden, Belknap & Swartz Company

Detroit, U. S. A.

Export Dept., 100 Broad St., New York City.

London—Paris

G-B&S motors



THE NEW YORK BETHLEHEM ORGANIZATION

New York speaks:

“ A year and a half ago, when I secured the Bethlehem distributorship in the metropolitan district, my organization consisted of three men. Today, my New York Bethlehem organization is fifty-three men. This is in addition to an Associate Dealer Organization of fifty-two dealers, all programming with me.

Measured by results secured by other metropolitan truck dealers, this is considered an enormous success. I personally believe it is directly attributable to the Bethlehem product, and the Bethlehem co-operation. I have never been associated with a group of men whose ideas of real co-operation were as pronounced as those of the Bethlehem organization. Their co-operation is real, and makes itself felt in almost every angle of the business. The factory officials seem to take as much interest in my success as I do. Their help has been an inspiration and there is real satisfaction in knowing that I am selling a good product in the Bethlehem truck and furthermore that it is sold at a fair price.

It is my appreciation of the Bethlehem truck, the fair and business-building policy back of it, and to thank the Bethlehem officials for their kind assistance that I have used this space.”

W. O. CRABTREE

New York's success is an indication of Bethlehem Dealer Prosperity the country over. And every Bethlehem Franchise carries Bethlehem cooperation. Your plans, plus ours, may start another prosperous Bethlehem Business. Write today for information about your territory. Bethlehem Trucks are made in the following models:

1½ Ton Chassis

\$1965

2½ Ton Chassis

\$2365

3½ Ton Chassis

\$3465

F. O. B. ALLENTOWN

BETHLEHEM MOTORS CORPORATION
ALLENTOWN, PA.

The Champions



Mr. Ben Davis, 5 times champion, again won the annual Wheatland Plowing Match this year, but in a new class. His previous championships have been won with horses. This year he won with the Moline-Universal Tractor.

Why did he select the Moline-Universal Tractor and why did he win?

Like all good plowmen, Mr. Davis likes to sit on the seat of his plow, so he can adjust it to meet all varying soil conditions instantly and do a good job of plowing. At any time he could stop and back up with the Moline-Universal as easily as he could go forward. And the Moline-Universal has the power to plow right along in the even tenor of its way in tough places as well as in the easy going—122 percent reserve power at Salina, Kansas, in 1918 and 108 percent reserve power at Columbus, Ohio, in 1919.

Mr. Davis is a great plowman and the Moline-Universal Tractor is a great Tractor. They made an unbeatable combination. That's why they won.

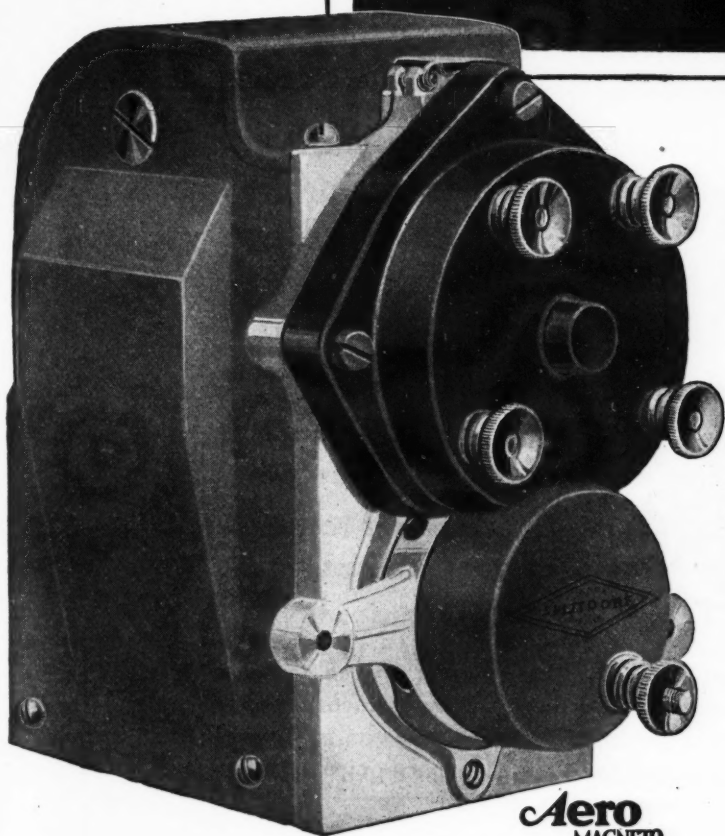
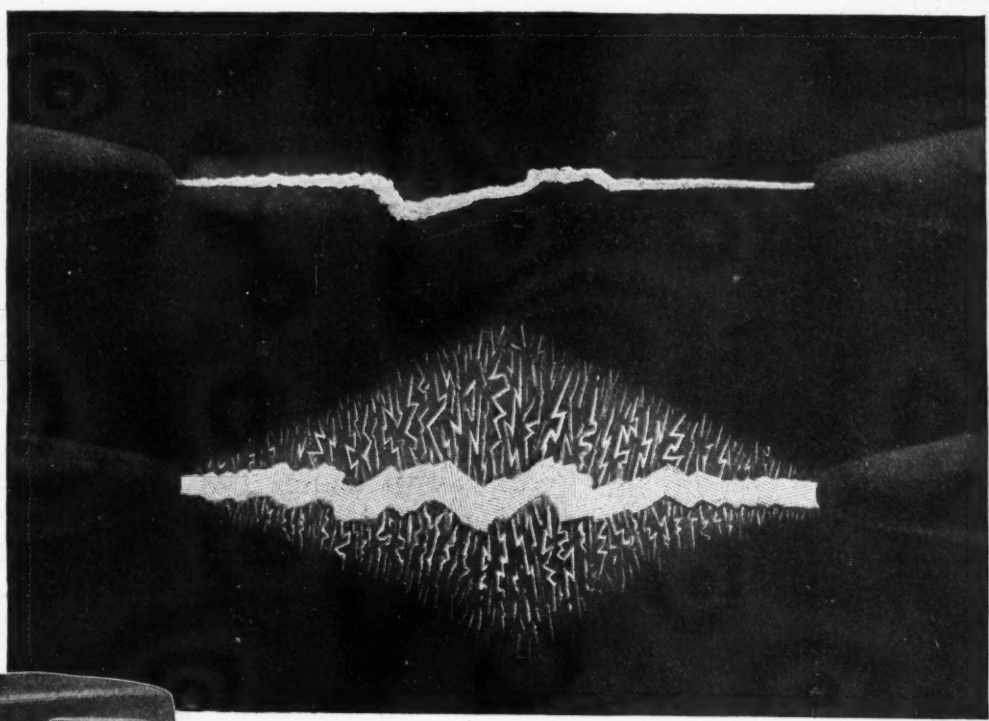
And Mr. Davis has a tractor in the Moline-Universal which he can use from one year's end to the next—for all field work including cultivating—and plenty of power for belt work.

MOLINE PLOW CO.

Moline, Ill.

*The Battery Spark
is lean*

*The Magneto Spark
is fat*



THIS diagrammatic drawing showing the difference between battery and magneto sparks is conclusive evidence of the superiority of Magneto ignition.

In official U. S. Government tests (A. P. P. report No. 13) the Splitdorf Magneto showed more than three times the spark heat shown by battery ignition. Oscillographic investigations also show the magneto sparks having much longer duration than battery sparks.

SPLITDORF

Electrical Co., Newark, N.J.
Sumter Division, 1466 Michigan Ave. Chicago



Manufacturers of AERO, SUMTER and DIXIE Magnetos, Oscillating Magnetos and Impulse Starters



What's Wanted in Tires

Many things are offered in tires—"exclusive features", "extra" this and that, etc.—but the thing that is most wanted by users is **mileage**.

"Mileage first" is the thing that is uppermost in the minds of the men who build Quaker Tires. To put the limit of mileage **in** and keep trouble **out** of Quaker Tires are the objects sought from the selection of crude materials to the finishing of the tires.



37x5
T. T. T.
(Non-Skid)
Reg. U. S.
Pat. Off.

Claims cannot put mileage into tires, but the kinds of materials put in Quaker Tires and the way the materials are put in result in getting mileage out.

The best argument for Quaker Tires is a Quaker Tire.

Put a Quaker to the service test on your car and be convinced.

QUAKER MULTI-TUBES are laminated tubes of the most approved type—not a single piece of material but many sheets of the finest rubber which become a whole in the "curing" process.

Unusual strength and long "life" are distinguishing features of QUAKER MULTI-TUBES.

QUAKER CITY RUBBER CO.

Manufacturers of Auto Tires and Inner Tubes, also Mechanical Rubber Goods

PHILADELPHIA
629 Market St.

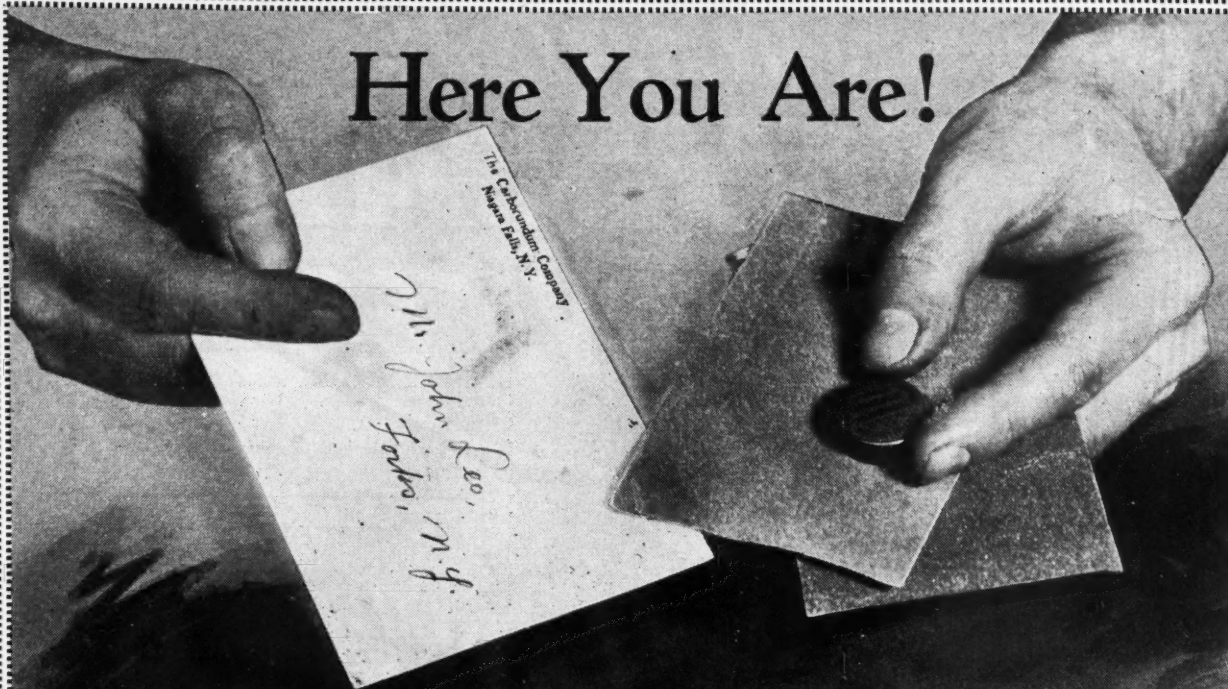
CHICAGO
182 W. Lake St.

PITTSBURGH
211 Woods St.

NEW YORK
53 Murray St.



Here You Are!



JUST send us your name and address and back will come an envelope containing a sample can of Carborundum Valve Grinding Compound and two sheets of Aloxite Cloth.

Try the compound on your next valve grinding job. Note how quickly and easily it cuts away the carbon and pit marks. How true, clean and smooth it leaves the valve seat. It cuts remarkably fast without scratching or scoring. It will do your valve grinding and lapping quicker, better, easier.

Try the sample sheets of Aloxite Cloth on any shop work. It cuts clean and quick, leaving a smooth, uniform finish. It is wonderfully flexible and is uniformly coated with Aloxite grains.

Your accessory jobber or hardware man carries both these products—the compound in handy combination cans or one or five-pound tins—the Aloxite Cloth in rolls, sheets, or better still, in Economy Rolls.

But Be Sure You Send for the Samples

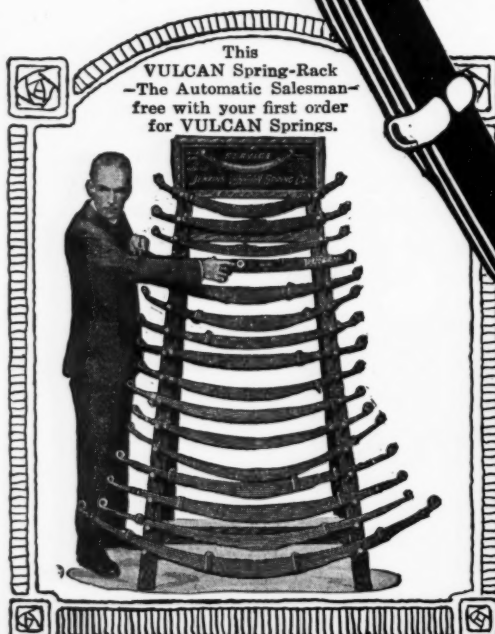
THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI PITTSBURGH
MILWAUKEE GRAND RAPIDS

WHAT IS VULCAN SERVICE?

The right spring—
(VULCAN)
in the right place—
(your store)
at the right time—
(when needed)
assuring the right profit—
(to you)
and the right service—
(to your customer).



BRANCHES:

Atlanta, Ga.
Kansas City, Mo.
Reading, Pa.

Boston, Mass.

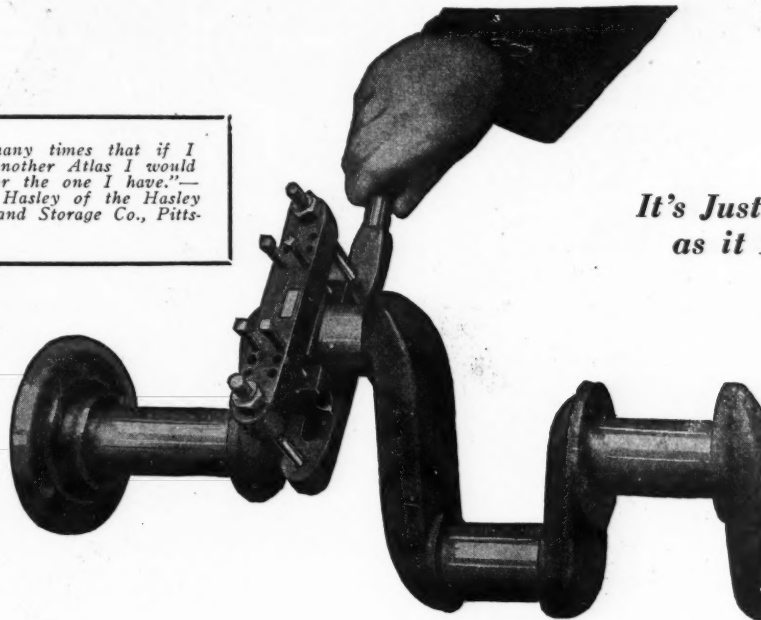
Dallas, Tex.
Minneapolis, Minn.
St. Louis, Mo.

Jenkins VULCAN
Spring Co.
Richmond, Indiana.

Do Your Own Crankshaft Grinding

**Your First Job Pays for an Atlas Abrasive Tool
No Expense—No Experience—No Equipment**

*"I have said many times that if I could not buy another Atlas I would not take \$50 for the one I have."—
Mr. Walter S. Hasley of the Hasley Bros. Transfer and Storage Co., Pittsburgh, Pa.*



***It's Just as Easy
as it Looks!***

**\$10 Complete
Postpaid**

Experience has taught you to "lay off" scraping bearings to crank pins, pounded out of round.

It's high time, however, to exercise your own cash register with some of those \$10 to \$25 crankshaft grinding profits.

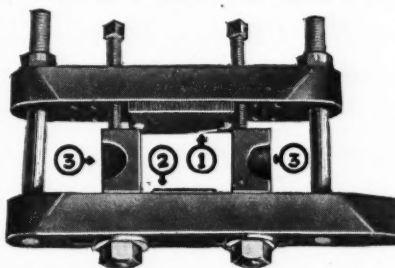
The hand tool for crankshaft grinding eliminates the machine shop, the lathe or grinder, the cost of experienced operators and the days or weeks of delay.

The Atlas Abrasive Tool is the least expensive of all hand tools. It costs only one-fifth to one-tenth of other crankshaft grinding tools.

It is the most convenient of all for by merely dropping the bot-

tom of the crank case, you can work right under the car with an Atlas.

Its work is accurate to one-thousandth of an inch—better than any machine shop will guarantee with a lathe.



- 1—Hardened and tempered steel cutter. Cuts in one direction only.
- 2—Bronze track bearing. Cannot cut ring in pin-like hard steel nor freeze against pin from excess friction like soft steel.
- 3—Adjustable Abutment blocks ease up against crank pin holding cutter and track in proper working place.

It works quickly. Within an hour it completes an entire crankshaft.

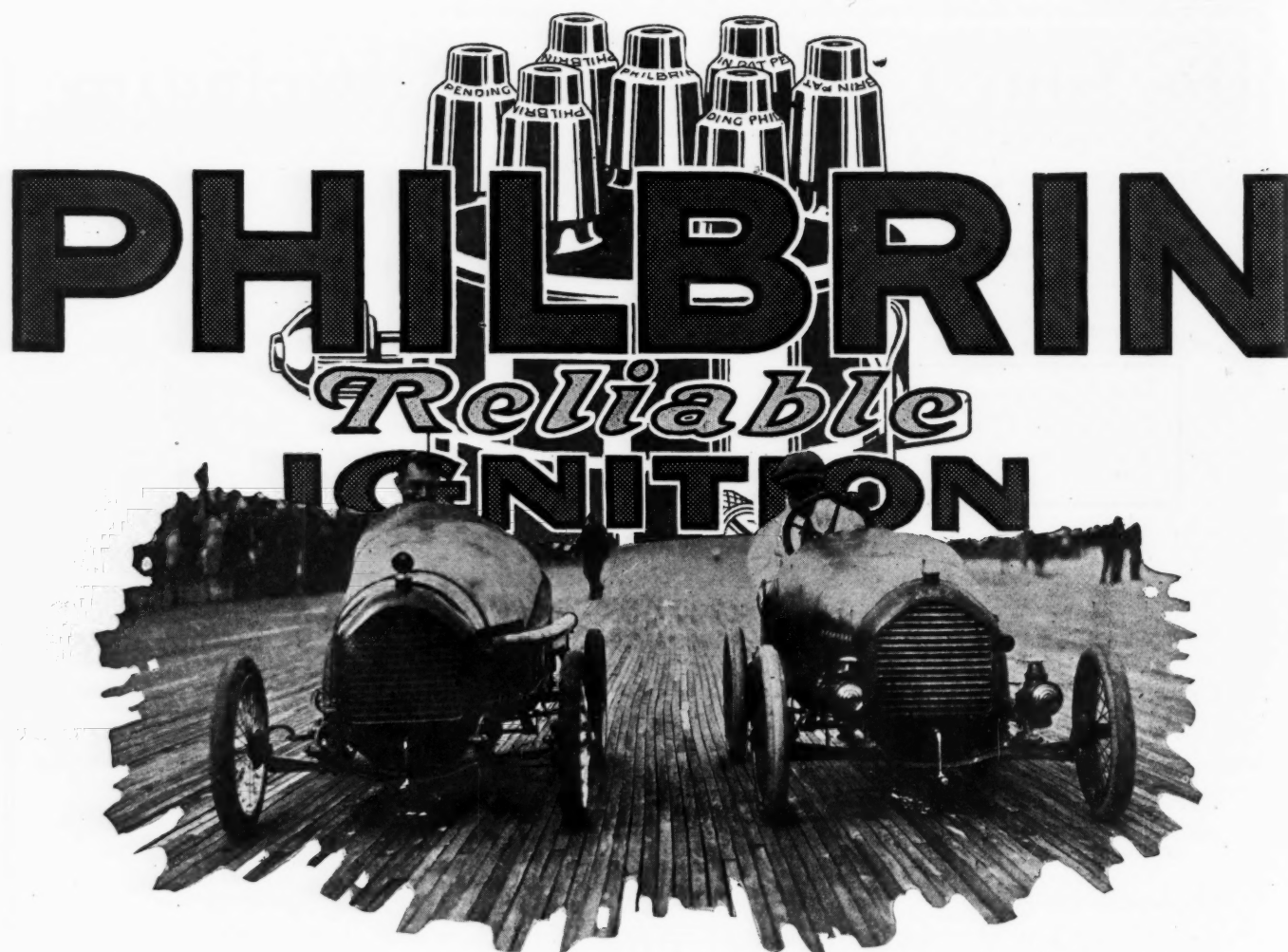
Made in only one size because it adjusts itself easily to fit any crank pin up to 2½ in. diameter—large enough for all passenger cars and trucks.

The quick, easy, simple, convenient and inexpensive way to grind crankshafts, as adopted by hundreds of garages and repair shops, is with the Atlas Abrasive Tool.

Its price, complete, postpaid, is only \$10. Extra cutters (including extra track bearings) good for truing up from ten to twenty pins or bearings, cost 30 cents each, postpaid.

Wire your order today. Money back; but you won't ask for it.

ATLAS MANUFACTURING CO., North Canal St., Pittsburgh, Pa.



Sol Barbarino Says Philbrin Ignition Made His Peugeot the Fastest Race Car of its Size in the World

—And N. D. Sturgis Gets 16 1-4 Miles to the Gallon of Gas on His Hudson Touring Limousine

A NEW chapter has been added to ignition history by the invention of the Philbrin condenser and contact maker. Users of Philbrin Ignition are recording achievements in economy, speed, flexibility, acceleration and an all-around improvement in engine performance that they had never thought possible.

On July 28, after a race at Sheepshead Bay, Sol Barbarino sent the following telegram to the Philips-Brinton Co.: "Driving my Baby Peugeot equipped with Philbrin Ignition in match race with another Peugeot equipped with magneto, won as I pleased. Philbrin Duplex Ignition has made my Peugeot the fastest race car of its size in the world."

His competitor, Ira Vail, was so greatly impressed by this performance that he decided to install Philbrin on his cars. After a thorough test on an Essex, he wrote the company as follows: "I have driven this car over 1,200 miles without trouble of any kind. I find the car is faster, starts easier, and throttles much lower than

before. I am using at least 20% less gasoline and am so well pleased that I have asked Mr. Stringer to equip my Duesenberg race car and also my 75 H.P. Mercedes touring car with Philbrin Duplex Ignition."

In his letter of August 7, N. D. Sturges, President of the Multiple Storage Battery Co., states that since installing a Philbrin System his Hudson Touring Limousine "has run, under varying conditions of open road and traffic in and around New York, on an average of 16 1/4 miles to the gallon. This is a remarkable performance for a car as heavy as mine. The car has everything in the way of speed, power and acceleration that can be desired, and I cannot endorse too strongly all the claims you make for Philbrin Ignition." Philbrin can be installed in place of any ignition system you are now using. Write for descriptive literature.

PHILIPS-BRINTON COMPANY

505 South Broad St.,

Kennett Square, Penna.





UNITED

SPARK PLUGS

*For Profit—
and Performance*

United Spark Plugs are big sellers.

They are *good* plugs—best heat-treated porcelain, unusually accurate machining and careful inspection give United Spark Plugs the stamina to fire a sure, explosive spark into the heart of the mixture, *all of the time*.

As soon as you show customers a United Spark Plug a sale is made—concentrate on United.

United Spark Plugs are repeaters—Spark Plugs for Profit and Performance—and you make a liberal profit on each sale.

Look in the Chilton Automobile Directory and Auto Trade Directory for List of Jobbers handling United Spark Plugs.

Ask your Jobber for the Plug in the Yellow Checkerboard Box

RETAIL PRICE	
Heavy Duty (for trucks and tractors)	Junior Type (for Passenger Cars)
\$1.00	75c

United Manufacturing & Distributing Co.
LAKE SHORE DRIVE AND OHIO STREET CHICAGO, ILLINOIS

Pacific Coast Representative
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GRAY-ANDREWS CORPORATION
73 Warren St., New York

Made for a Purpose— *— Consistent Ignition*



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FOR
YOURS**

**Needed In Every
Repairshop**

UNIVERSAL PISTON INSERTER

Every mechanic who ever replaced a piston in a cylinder will recognize the value of this tool. On Ford engine jobs alone the time of inserting pistons is reduced to a small fraction of the time required by the old method. The above illustrations tell the whole story. Figure it out for yourself and see if you can afford to be without this handy, time saving economical tool. Place the UNIVERSAL PISTON INSERTER on top of the cylinder, push the piston through and the job's done (the rings are automatically compressed by the tapered shape of the tool). No injury to piston or rings. Can be used for inserting oversize pistons.

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Get this tool at once. You need it in your shop. Made for any bore. State size when ordering or just say "For Fords." This is but one of a line of worth-while products which we will soon be manufacturing for you.

G. C. MONCKMEIER
Tipton, Iowa



\$1.50
each

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Send me Universal
Piston Inserters..... follow-
ing sizes:

For Fords For inch
bore For inch bore
For inch bore For
..... inch bore For inch bore.....

Name

Address

City State

My Jobber's Name and Address Are

CUSHION Roughness Out of Roads

Save Trucks *and* Trucking Costs

Gillette Solid Truck Tires possess the resiliency of a pneumatic—sponge up shocks—cushion roughness out of roads. They save the truck—save repair costs. *And* they possess wear-resistance that keeps them *on* the road longer than any other solid truck tire ever produced. They save tire costs.

This nearest-the-state of perfection ever achieved in production of a Solid Truck Tire, is made possible by the perfected Gillette Chilled Rubber Process—a refining treatment that toughens rubber *without* robbing it of resiliency.

A trial is sure to prove the Gillette your idea of ideal Solid Truck Tire.

Gillette Rubber Company

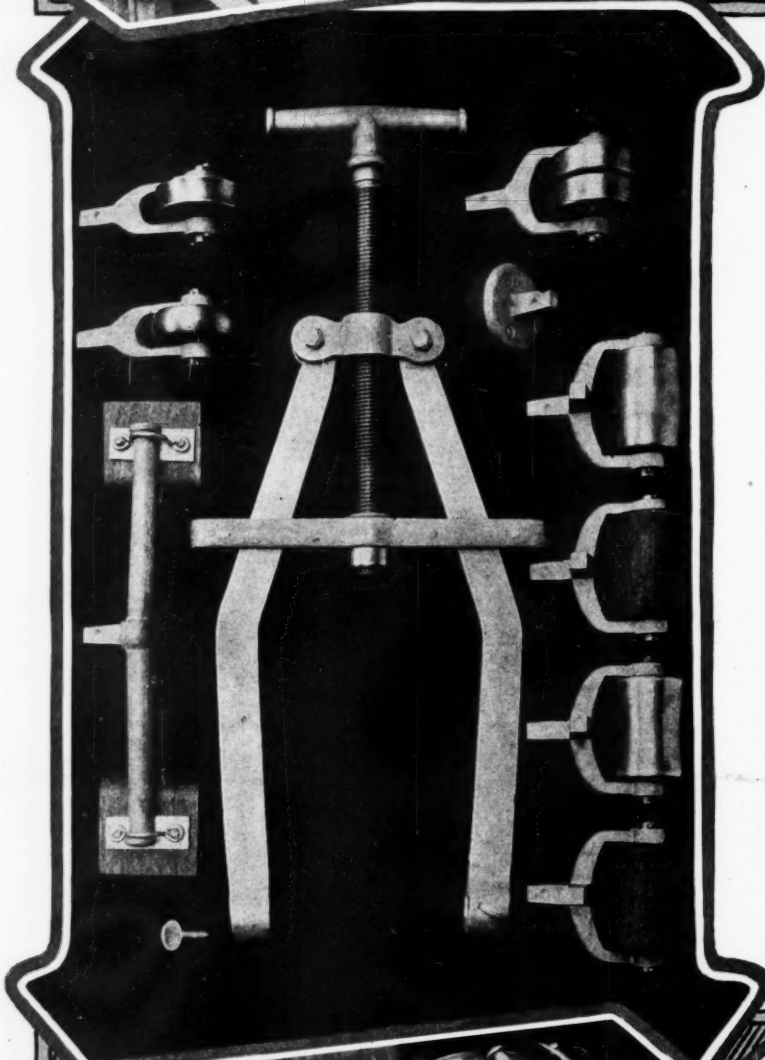
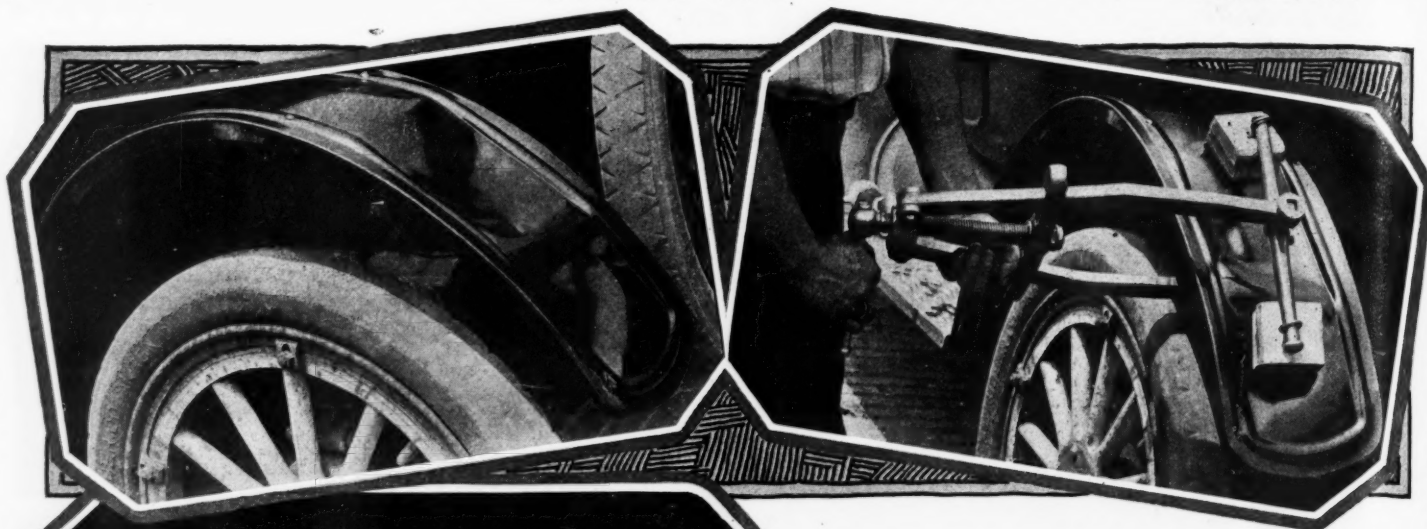
General Sales Office:
1834 Broadway, New York

Factory:
Eau Claire, Wis.

A Bear for Wear

Gillette

SOLID TRUCK TIRES



Straightens Fenders While They Wait —Profitably

Think of the thousands of cars which pass your door daily—hundreds of which will stop—and take advantage of your quick, economical method of straightening fenders while they wait.

Every fender sooner or later gets jammed, dented or marred. Frequently owners are obliged to lay up their cars while the fenders are taken off and straightened—or while new fenders are replaced due to the inability of ordinary devices and methods to restore the original appearance.

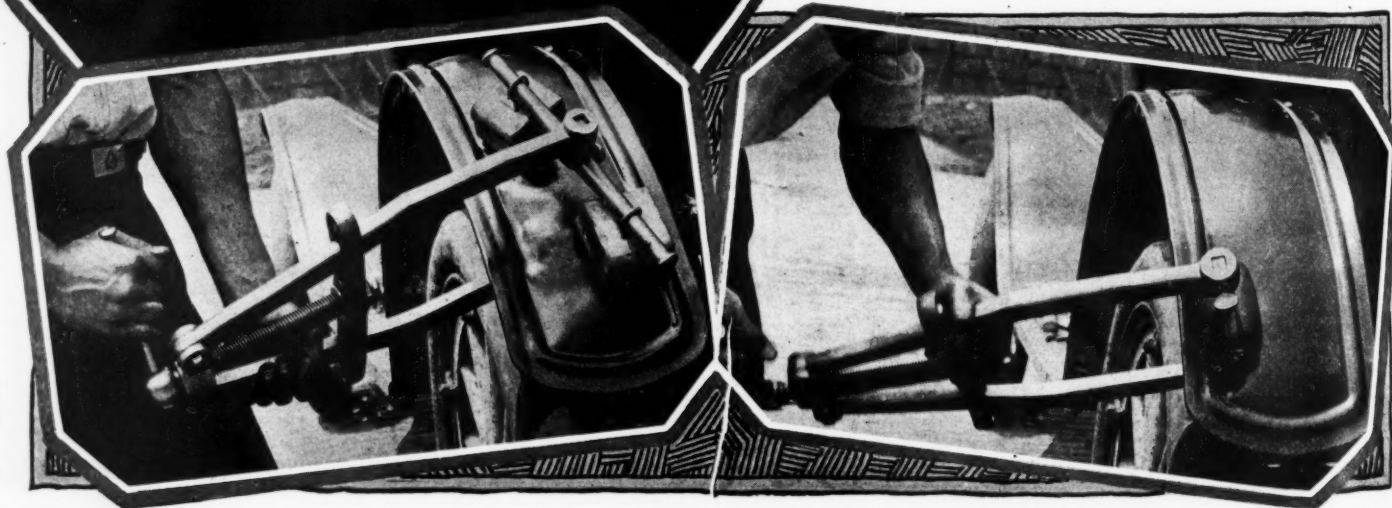
The STILES FENDER STRAIGHTENER does the job quickly and without marring the enamel or finish. No matter what kind of a fender—flat, oval or fluted—or how badly dented—there is a special shaped straightening tool to press or roll out the worst abrasions.

Here is the real money maker—a new way of making big money day after day—and when your customers know that you have a STILES FENDER STRAIGHTENER in your shop that will actually do the work—they will be mighty glad to drop in for a few minutes and let you iron out some of the fender dents, which have been ruining the appearance of their cars.

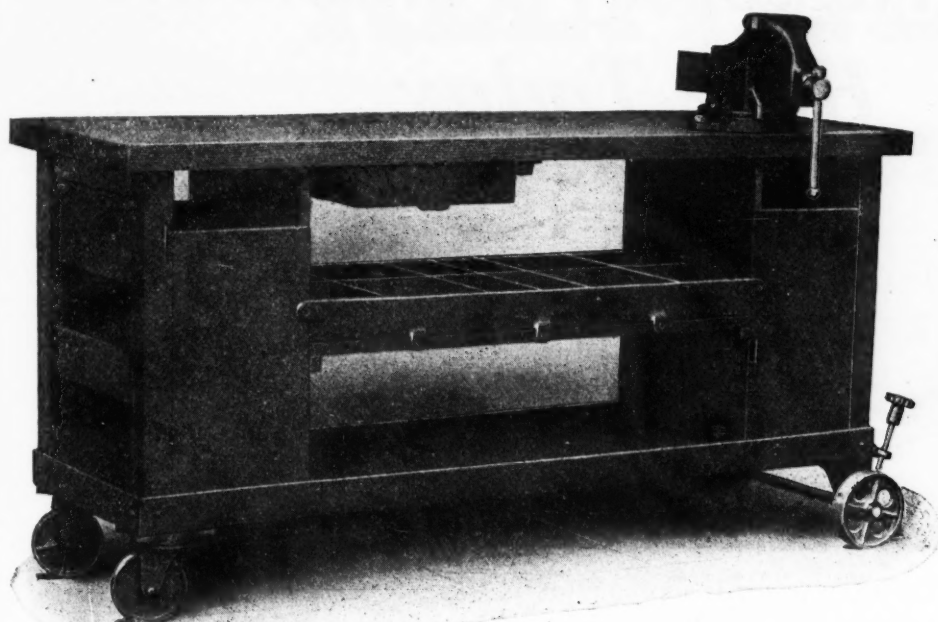
It will pay you big to send for illustrated literature and full particulars TODAY. Price only \$30—and it starts paying you back from the first.

STILES-GILLILAND MFG. CO.

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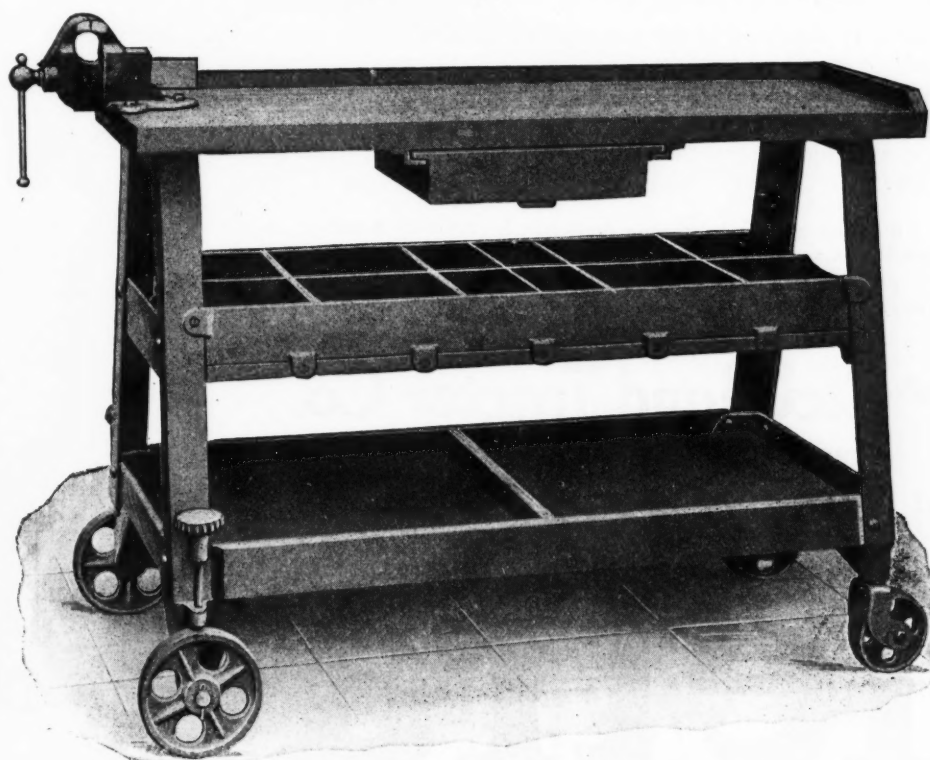
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*Take
Your Shop
to the
Car*

Save your customers' time and your workmen's time on repair jobs by having your bench with vise and tools and necessary parts at your finger tips—eliminating all of those usual round trips to your stationary bench.

INCREASE YOUR PROFITS



**GARAGE & SHOP
Manley
EQUIPMENT**

PRESSES.
CRANES.
ENGINE
STANDS.
PORTABLE
BENCHES.
WRECKING
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SERVICES.

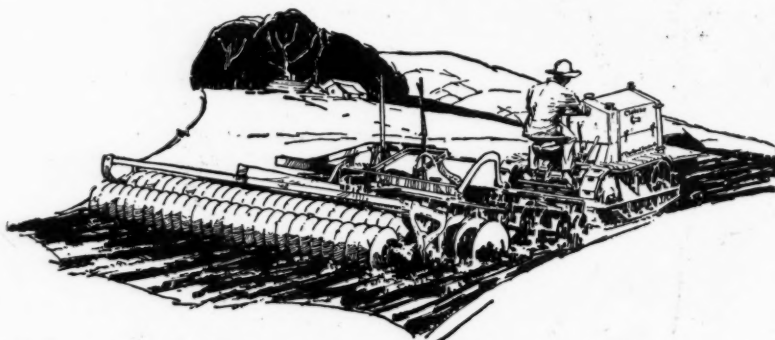
MANLEY BENCHES
are made in two sizes—
for light and heavy
duty.

Write for Descriptive Catalog of Manley Garage Equipment

THE MANLEY MFG. CO.

York, Pa.

The Tractor of Tomorrow Here Today



Year 'Round Service—Year 'Round Sales

The tractor that the farmer is looking for is the one that he can use the greatest possible number of days each year.

Thousands of building contractors, road makers and factories must have the same kind of tractor to overcome labor shortages.

Because the Cletrac meets this need, both for the farmer and for the industrial user, it makes an ideal year-'round selling proposition for Cletrac dealers.

The Cletrac is not only supreme in the **variety** and **quality** of the work it does, but it is the tractor that is built to stand up and do its work under the most difficult conditions.

And, while having the power and the stamina to carry it through the grind of heavy work, it is small enough for economical use on the lighter tasks of either drawbar or belt.

In the Cletrac you will find the tractor you have wanted to sell—the tractor your customers have waited for.

We have a most interesting book which goes into detail regarding the Cletrac selling plans and opportunities.

This book is called "Sale Quality in Tractors" and your copy will be sent on request.

The Cleveland Tractor Co.

19169 Euclid Avenue, Cleveland, Ohio

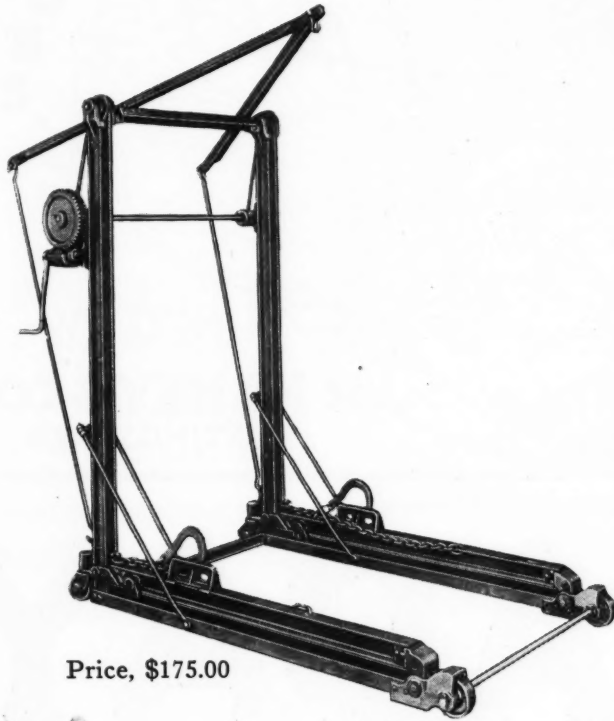
The largest producers of Tank Type Tractors in the world

Cletrac

TANK-TYPE TRACTOR

KLEMME

ONE MAN AUTO HOIST AND CRANE



Price, \$175.00

WITH the KLEMME Auto Hoist and Crane you can lift the rear or front end of a car to any height to suit the job. No more need of mechanics lying on their backs in a cramped position working in the dark with oil and gasoline dripping down on them—no more crawling into filthy pits.

The KLEMME Hoist lifts from underneath the axle, which is the only correct, practical and safe way of lifting a car. There is no danger of marring the finish of a machine with chains or cables—no chance of slipping off or dropping down—and all the time the men are at work the car is absolutely rigid.

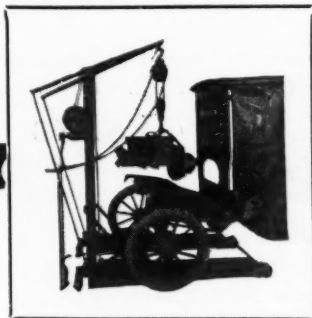
It is easily moved from one point of a garage to another, in fact one man can easily operate the KLEMME at all times.

Crane attachment takes the place of an overhead track. Can be used to lift out motors, transmissions, bodies, etc.

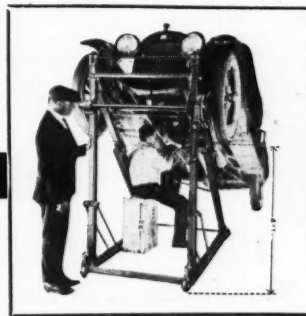
Write us today for further information on this One-Man Auto Hoist

Manufactured by
A. C. KLEMME MFG. CO., Davenport, Iowa

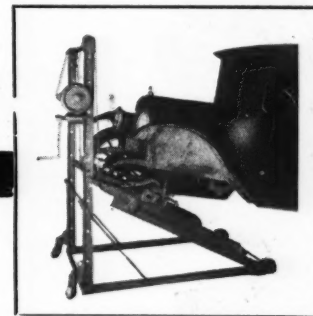
Sales Department
Bailey-Drake Company, Inc.
1120 So. Michigan Ave., Chicago



Crane Attachment easily operated — quickly moved around



Hoist allows mechanic to work in comfortable position with plenty of light



Either end of car can be raised to any height desired

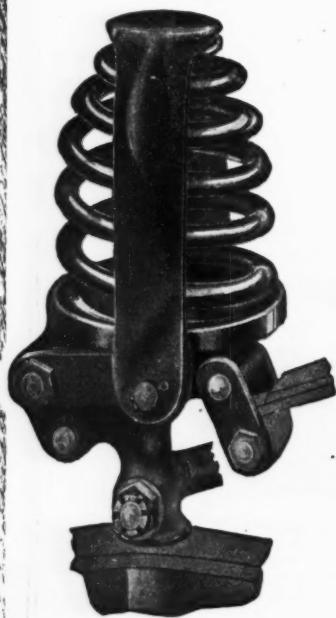
**MOST JOBBERS
AND
DEALERS
SELL
THE
ROSE LINE
OF
PUMPS
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**ROSE
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**MFG BY
J.H. HANEY & CO
HASTINGS NEB**

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Direct Suspension Shock Absorber



The Most Successful Shock Absorber Ever Put on a Ford Car

Thousands of Halladays are daily proving their ability to smooth out the roughest bumps, are demonstrating their employ by saving real money on tires, gas and repairs.

The Halladay is accomplishing all this because the "beehive" springs have the capacity to take all the jolts and jars out of the light little Ford.

Price per Set.....\$15.00

Mr. Dealer, make the Halladay success your success. Write us for full particulars today.

L. P. HALLADAY COMPANY
Manufacturers of Bumpers, Shock Absorbers and
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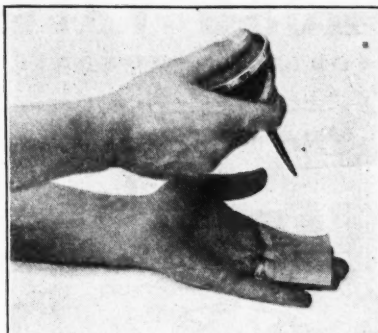
Streator, Illinois

"ZIP" The Real Tube Patch

**SIMPLE
EFFECTIVE
INEXPENSIVE**



Cut patch to desired size, making it large enough to amply protect the break.



Thoroughly wet the face of the patch with gasoline, allowing it to dry enough to become sticky.



See that patch thoroughly covers break and press firmly into place.

NO CEMENT

NO HEAT

NO SKILL

"ZIP" PATCHES CAN BE APPLIED BY ANYONE—ANYWHERE

Write for our attractive Jobber and Dealer propositions.

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KANSAS CITY, MISSOURI

Established 1870



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THE CLASS JOURNAL COMPANY
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The Automobile Repairman's Helper

THIS collection of methods of repairing motor vehicles is intensely practical, for it takes up the subject from the repairman's point of view. For a long time there has been a crying need for a standard work of reference for both garage mechanics and car owners who like to do their own work, that really tells in one, two, three order, the correct method of doing any given job on an automobile.

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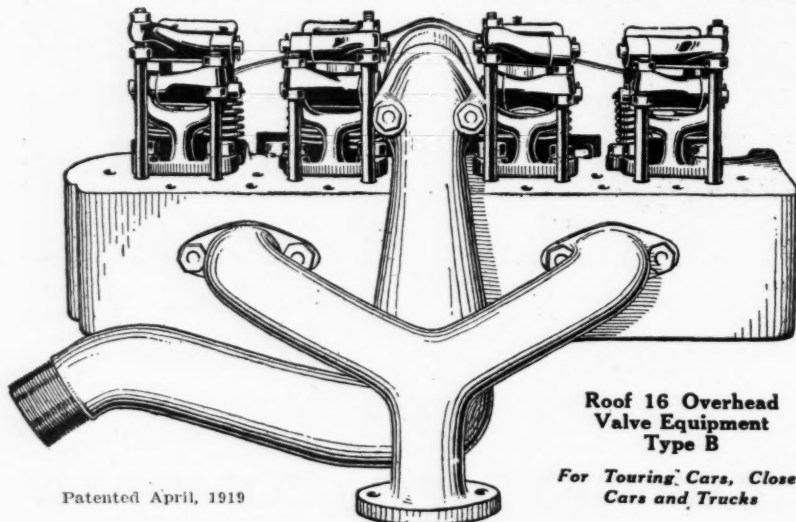
448 pages. 7x4 $\frac{7}{8}$ inches, oblong. 317 figures.
Flexible Red Art Leather. Price \$2.50 postpaid.

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243-249 West 39th Street NEW YORK

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Roof 16 Overhead Valve Equipment

FOR FORD MOTORS



Patented April, 1919

**Roof 16 Overhead
Valve Equipment
Type B**

*For Touring Cars, Closed
Cars and Trucks*

Comparison Brake Horse Power Tests at the United States Bureau of Standards gave Standard Ford motor with regulation carburetor 18.7 Horse Power. The same motor with 16 Valve Head and regulation carburetor 22.4 Horse Power. The same motor with 16 Valve Head and Special carburetor 29.7 Horse Power. Recent tests at U. S. Bureau of Standards gave 32 Horse Power. We are Manufacturers and Distributors of speed and other specialties for Ford cars; 3 to 1 gears, high speed camshafts, aluminite, light grey iron pistons, lynite pistons, aluminite connecting-rods, racing spark plugs,

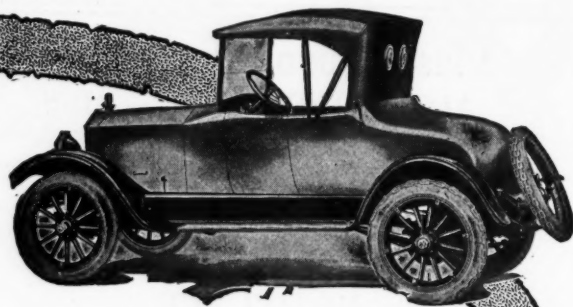
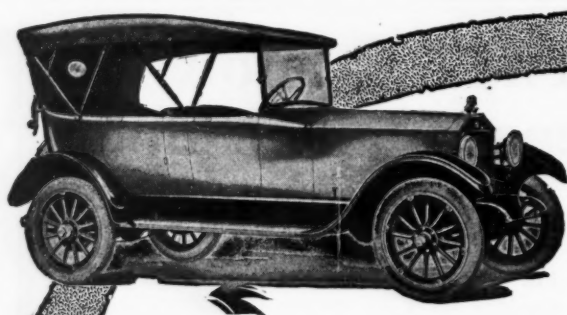
racing carburetors, roller bearings, counterbalances, wire wheels, multiple speed transmission, high tension magnetos, special oiling system, special worm and gear, steering gear, racing tires, racing bodies, hood and radiator, parts for underslinging chassis. Tell us what you want. We can supply it. Racing quality. Lowest prices. Send for our Complete Literature on how to build fast cars and double the value of your converted Ford Truck and descriptive circular on Speed and other Specialties for Fords.

LAUREL MOTORS CORPORATION

The Most Remarkable Power Device, Even in This Inventive Age

Hill Climbing for touring cars—pulling power through sand and mud—doubles the hauling capacity of converted Ford truck-speed for mile and half-mile tracks to rival the fastest cars built. Ford racing cars with our Cylinder Head Equipment and special racing parts have attained speeds from 80 to 100 miles per hour. Price, complete, \$115.00 f. o. b. factory, excise tax paid. Nothing extra to buy. Cylinder Head Equipment all ready for installation. It takes the place of the regular Ford Cylinder Head. Any mechanic can easily and quickly install it.

Anderson, Indiana, U. S. A.



Dixie Service

Service is easier to pronounce than to perform.

But the permanent success of any dealer depends almost entirely upon his ability to offer service—service both in car performance and factory cooperation.

The good reputation of the Dixie Flyer is founded very largely upon its invariable

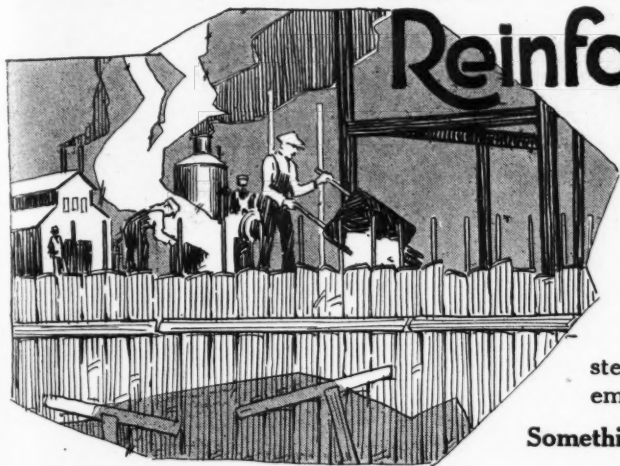
satisfactory performance under all conditions and the generous cooperation of the forty-year-old company back of it in helping the dealer to attain a permanent footing high in the scale of successful selling.

We welcome inquiries from live dealers everywhere who appreciate this brand of "dealer help."

KENTUCKY WAGON MFG. CO., INCORPORATED, THIRD AND G STREETS, LOUISVILLE, KENTUCKY

The **DIXIE** *Flyer*

The **DIXIE** *Flyer*



Reinforced Like Concrete

(And For The Same Reason)

Concrete is reinforced to give **added strength**. The same thing applies to Durham's DUR-A-BUL Blow-Out Patch. A screen of knit steel wire is built into the patch which gives **double strength** at no greater cost. The entire construction of the patch is of the best—5 to 8 plies of fabric, one ply 32nd cushion, one ply steel wire mesh. An absolutely unsurpassed blow-out patch for emergency work.

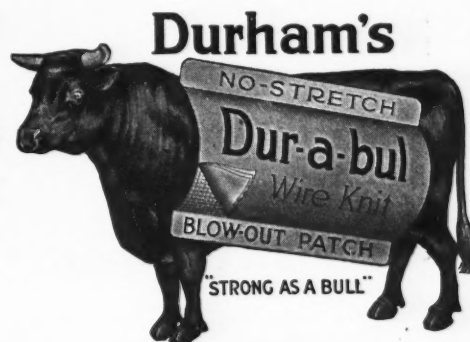
Something for Jobbers and Dealers

Upon request we will send free to any established jobber or dealer one full sized patch, which can be used for test purposes. We want you to be the judge, for we know this will prove the DUR-A-BUL Patch is more efficient.

Write for your sample and our proposition



Note the reinforcing layer of steel wire



Durham Mfg. Co.

230 Rialto Bldg., Kansas City, Mo.

The Most Remarkable
Automobile Top Material

LIGHT IN WEIGHT—DEPEND-
ABLE IN QUALITY—NON-CRACK-
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Made to Satisfy.

Send to Dept. C for Samples and Prices

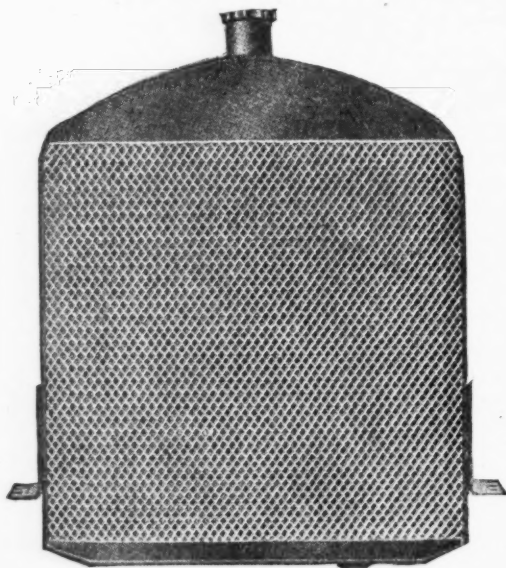
L. J. MUTTY COMPANY

BOSTON, MASS.

Retail Price

Radiator Without Shell \$19.50

Radiator Complete \$21.00



Put a Standard Radiator On Your Ford

Standard Radiator dealers are making big sales and big profits on Standard Radiators every day by showing that this radiator performs real service at a low price.

Made as good as a radiator can be made of standard radiator brass, hand soldered and finished. Expert workmen and a model plant combine to keep prices reasonable.

This high grade honeycomb 2½-in. brass core radiator is interchangeable with the regular Ford and fits the Ford Shell. Each radiator tested to 10 pounds air pressure.

A shipment will be sent C. O. D. with 5 day return privilege.

There is a nice dealer's discount. Write for it today.

Radiator cores or complete, for all cars. Write your needs.

Sold direct if dealer does not handle.



STANDARD RADIATOR CO.

SPRINGVILLE

NEW YORK

STANDARD RADIATORS FOR FORDS

Some Piston! *Latest Improvement For* Ford Cars

Complete With Rings and Pin

*A Cochran Product***INCREASES MILEAGE 25%***Light Weight Step-Cut Rings Oil Groove*

Furnished in Standard Size. Also the following Oversize.

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DETROIT METAL PRODUCTS CO.,
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1 complete set of COCHRAN PISTONS
Size.....Price \$7.20

Name

Address

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COMBINATION

Keyless Lock for Fords

Positively Thief-proof—That's Why It Sells

Thousands of combinations are possible with the CHRISTIE and the right one must be known before the engine can be started. A turn of one button cuts off the ignition and locks it. Baffles the professional auto thief. The CHRISTIE is securely bolted to the coil box. The heads of the bolts are covered by the top of the lock and cannot be removed.

Underwriters' Laboratories Inspected—Reduces Insurance 15 %.

The CHRISTIE gives positive protection at all times. It is the one lock thieves will not waste time with because it **CANNOT BE WIRED AROUND**

There is only one way to start a Ford engine CHRISTIE locked and that's by working the right combination.

WHAT WE OFFER DEALERS

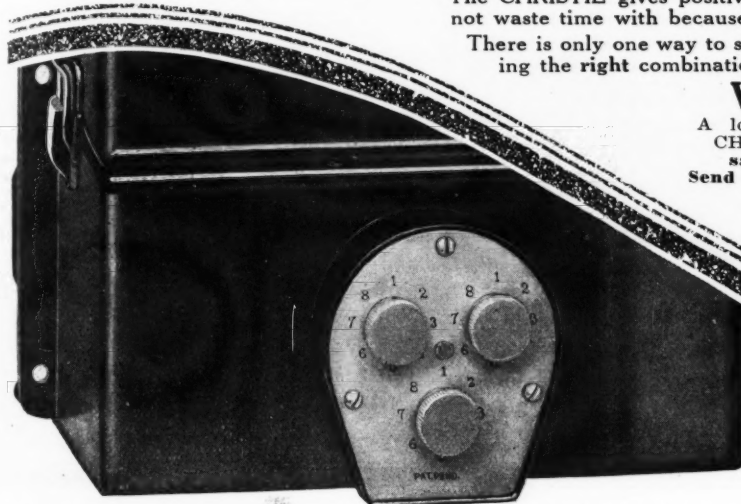
A lock proposition for Fords out of the ordinary. The CHRISTIE is an absolutely safe lock and our proposition a safe profit builder.

Send draft for first sample lock and details of our proposition.

CHRISTIE AUTO LOCK CO.

6607 Dorchester Avenue.

CHICAGO, U. S. A.



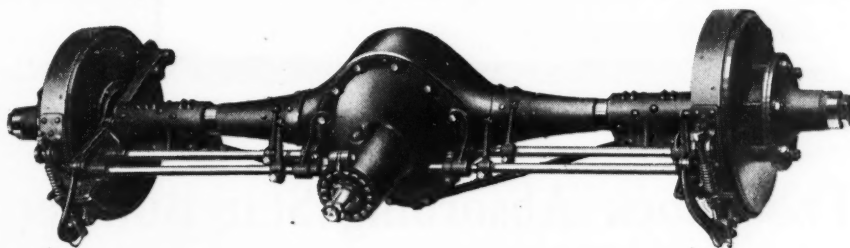
PRICE

\$6.00

MONEY BACK GUARANTEE

Salisbury Axles Are Standard

*The New Salisbury
Pressed Steel
Rear Axle*



*Standard
Type*

SALISBURY AXLES incorporate many improvements and betterments tried and proven by exhaustive engineering tests and practical use. Each Axle is submitted to careful factory test for strength and mechanical perfection before shipping.

The various axle members are designed for accessibility, strength, simplicity of construction and are "fool proof" as far as possible. Pinion shaft bearings cannot be jammed by improper adjustment.

The mounting in the spiral ring gear "the Salisbury way" insures greater rigidity and perfect alignment.

The rear wheels fixed rigidly to the driving shaft by a steel flange bolted to the hubs hold steady against side strains through a wide spread of bearings and permits of easy accessibility to driving shafts.

This gives all the advantages of the full floating type and eliminates its disadvantages.



Established 1902

Manufactured for Automobiles weighing 2600 to 3200 lbs.

Salisbury Axle Company

Jamestown, New York, U. S. A.

To Motor Truck Dealers—

Those dealers who are now selling Triangle Trucks are making money. They find the truck a good seller because of its many sales points. They find that repeat orders are not uncommon because the satisfactory performance of Triangle Trucks will bring a customer back.

TRIANGLE TRUCKS

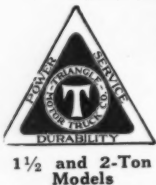
Triangle Trucks are built right and stay right. We are careful in making our claims—we do not attempt to claim the impossible. The entire Triangle story can be summed up in a few words: "Honest methods from start to finish."

Write or wire for complete details.

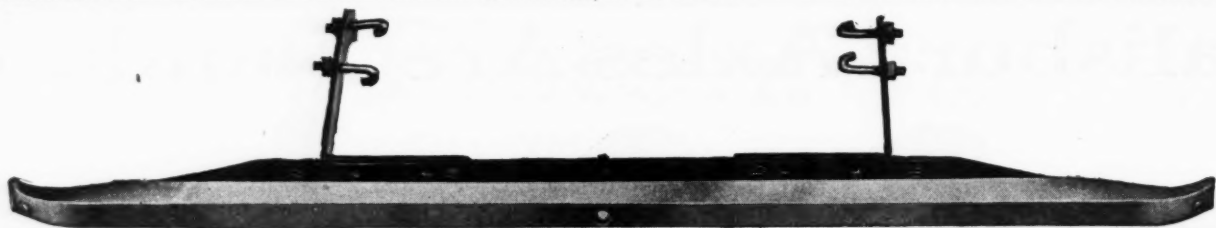
Eastern Representatives:
Triangle Motor Company
381 Fourth Ave., New York City

Triangle Motor Truck Co., St. Johns, Mich.

New England Distributors:
Eugene F. Lally & Sons Company
Boston, Mass.



**"BUILT TO DO
A TRUCK'S WORK"**



The Shock Absorbing Star Bumper Protects the Car Without Damage to Itself

GLANCING side blows—head on shocks, are all parried by the Star Bumper.

It so absorbs the blows that it not only protects the car but does this without any damage to itself. You'll never find a Star bent or twisted out of shape.

For 3½ inches back of the protecting front channel bar is a straight bar, between these are five strong coil springs that diffuse the shock—taking it up before it reaches the car. From

this strong spring cushion run arms of steel back to the frame—clamped on with a bulldog grip.

Rubber inside the springs insures against any rattle.

The Star Bumper is made of high carbon steel—finished in nickel and black. It fits any car and goes on either front or back of car.

Write your jobber for Star Bumpers—it pays you a profit that makes selling it worth while. Write today—now.

Jobbers—Get our liberal trade proposition, also write for a sample bumper.

Clevenger Engineering and Sales Co.

86 McKinley Place, Ridgewood, N. J.



STANDEX Automatic System Solves the FORD PROBLEM OF LUBRICATION.

\$10.00
Complete

WHY WORRY about your lubricating oil?
WHY DRIVE YOUR CAR in a smother of smoke? Why contend with carbonized cylinders and sooted spark plugs—an engine that fails at the critical moment?

WHY GUESS AT YOUR LUBRICATION—when lubrication is vital? Why trust to pet-cocks to indicate how your oil-level stands? Why not be SURE—and untroubled?

Standex Automatic Lubricating System Is Sure!

CARBON TROUBLE—Ignition Trouble—Engine Trouble—Every trouble due to faulty lubrication, disappears when this infallible system is installed on your Ford.
NO MORE STALLING ON THE ROAD—no more of that dirty job of “getting under,” only to find the crank case dry and the engine bound up tighter than a drum!
AUTOMATICALLY—the Standex System feeds oil to crank case whenever motor is at rest—replaces all the oil consumed while running. There is simplicity for you! And your biggest problem solved!

Distributors, Here Is Your Opportunity!

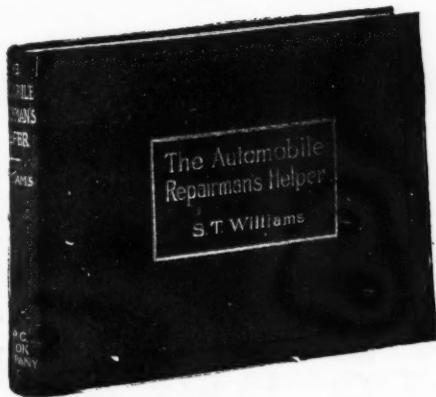
STANDEX INDISPENSABLE MOTOR DEVICES meet the Ford Owner's actual needs. Simply show them: They'll sell without pushing. Every one of them is backed by our ironclad guaranty—**MONEY BACK IF THEY DON'T DELIVER THE GOODS!**
WRITE US TODAY for details of our proposition B-17 to distributors. If your territory is still open, you cannot afford to miss representing us.

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The Automobile Repairman's Helper

By S. T. Williams



A pocketbook for the mechanic, owner, chauffeur, and student, giving in concise form and in consecutive order, every operation required to adjust or repair the troubles likely to be found in all standard cars, with chapters on Inspection and Lubrication, Drills, Taps and Lathes, Welding, Storage Batteries, Cylinder and Piston Ring Work, Bearings, Axle Adjustments, Repairing Tops, Mudguards, Lamps, etc.

For a long time there has been a crying need for a standard work of reference for garage mechanics, and car owners who like to do their own work, that really tells in one, two, three order, the correct method of doing any given job on an automobile.

Twenty-two pages of cross reference index enable the reader to find any item at a glance. The book is printed on medium weight paper so that it may be carried in the coat pocket.

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317 Figures
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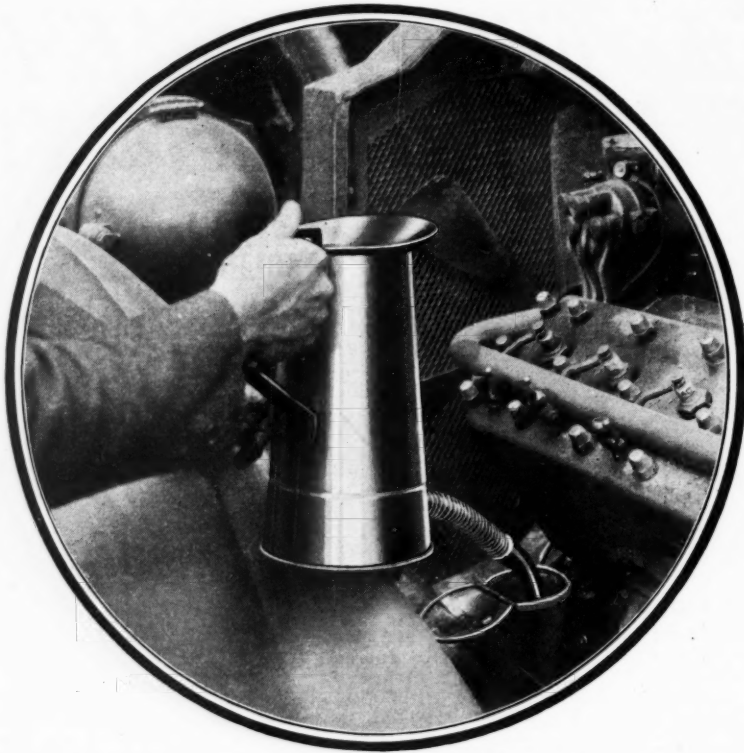
New York

B-11

Contents by Chapters

1—Inspection and Lubrication. 2—Drills, Taps and Lathes. 3—Straightening Mudguards, Body Lamps and Other Parts. 4—Simplified Directors for Welding. 5—Cylinder Piston and Piston Ring Work. 6—Ball, Taper and Roller Bearings. 7—Storage Battery Care and Repair. 8—How to Repair a Top. 9—Timken Rear Axle Adjustments. 10—The Ford. 11—Willys-Knight. 12—The Overland. 13—The Oldsmobile. 14—The Dodge. 15—The Cadillac. 16—The Buick. 17—The Chalmers. 18—The Reo. 19—The Saxon. 20—The Maxwell. 21—The Chevrolet. 22—The Borg & Beck. 23—The Cole. 24—The Northway. 25—The Hudson. 26—The Studebaker. 27—The Oakland. 28—The Liberty. 29—The Paige. 30—The Hupmobile, Series N and K. 31—Standard Adjustment on the Hupmobile, Series R.

No More Use for a Funnel



A handy, clean, economical liquid measure that delivers your oil where you want it without waste or muss.

No more need for the wasteful, old funnel—or for the dripping, inconvenient measure. With this ALL-IN-ONE measure fitted with its flexible metal tube, you not only measure the oil, but also put it into the crankcase without spilling a drop—without even soiling your hands.

Just insert the end of the flexible metal tube in the filler plug of the crankcase or other receptacle, press the thumb lever which releases the valve, and the oil flows just where you want it.

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ALL IN Takes
The Place
Of Them All



Here Is a Timer That Is Built Right

This is the timer that embodies those eternally sought for qualities of sturdiness, dependability and efficiency. 50,000 miles of perfect ignition—that's the guarantee behind the

DUNTLEY MAGNETO BREAK TIMER

The Duntley requires no lubrication. There are no sliding contacts to become insulated with oil or wear the contact bed.

The positive make and break contact overcomes starting troubles, and insures perfect timing on all four cylinders.

Thousands of letters from users, testify to the fact that the Duntley is the most econom-

ical and efficient Timer ever put on a Ford Tractor. Let us show you why.

Remember—the Duntley Magneto Break Timer is sold on an absolute money back guarantee.

We have a mighty interesting dealer proposition for you.

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A Natural Shock Absorber

IT IS an indisputable fact that no acceptable substitute for curled hair as an upholstery filler has as yet been discovered or invented.

But curled hair has been advanced a step farther in usefulness by the scientific methods of **WILSON & CO.**

WILSON Woven Curled Hair

is woven securely onto burlap forming a thick, sanitary, resilient pad which prevents the hair from shifting or bunching.

Its extraordinary resiliency is based on the concerted resisting power of millions of tiny hair spirals. These miniature spirals everlastingly absorb shocks and pressures without losing their "pep" or springiness. They last—and there lies a tremendously important economy.

First cost is final cost, if you use *Wilson's Woven Curled Hair* to safeguard the seats and backs of your cars.

It is a prestige builder for the upholstery of which it is a part—and for the car of which you are the maker.

Send us blueprints of seats and backs, specify requirements, and we will submit prices and samples.

Write for our free booklet—"Comfort in Upholstery." Address Dept. MA-10

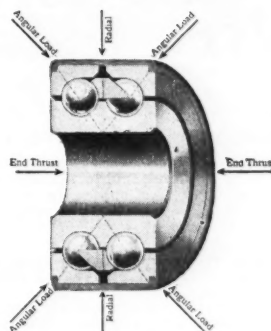
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WILSON & CO.

your guarantee

CHICAGO

Quality



The DOUBLE ROW Type.

REMEMBER that the primary function of an anti-friction bearing is to prevent loss of power between rotating shafts and adjacent mechanism. If this were not so, the old practice of using plain bushings would be just as good.

Only that bearing is valuable which reduces frictional loss most completely.

The ball type does this most effectively. The New Departure Double Row is the highest expression of the ball bearing for thrust and radial loads, since the angular contact of balls and races permits a free and true rolling motion at all times.

No climbing of races due to centrifugal action. No wedging—no binding—no cramping.

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Kester Acid-Core Wire Solder

This solder is very easily used because you don't have to bother with a separate flux. It has the flux right in it. It has a core made up of little pockets filled with flux. As solder is melted off, the flux flows out on the job and insures a perfect bond.

SAVES TIME AND TROUBLE

It eliminates the inconveniences of a separate flux, and always results in a better job. Auto repairmen or auto owners who once use it, will never go back to the old time method of using a separate flux.

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*Sold in one-pound cartons and on one, five and
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Strength



WAYNE TYPE "B"

Hand Pump Sells Easier



We realize that you can't spend a lot of time "talking" every article you carry in stock. So we built this pump to speak for itself—it looks quality.

It is strong—durable, and its construction is simple.

Set it out where your customers will see it and your customers will soon be asking about the Wayne.

Its indestructible steel tube handle welded to the piston rod—the man's size coupling that allows for a real grip—the steel tube cylinder will not rust nor easily dent. It is secured to the base by the shoulder seating method that prevents leakage—the heavy weight hose, guaranteed for one year, makes the Wayne Pump supreme.

Stock this pump—every sale nets you a good profit. Write for discounts.

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MOTOR TRUCKS

*Guaranteed
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Year—*



You may have wondered why Jumbo Trucks can be guaranteed for a full year—

The answer is oversize parts throughout, attention to details and accuracy of manufacture.

Most dealers are not accustomed to such oversize strength as Jumbo Trucks possess, but Jumbo dealers now know that this oversize strength protects their customers against frequent repairs and breakdowns.

It makes every owner a booster and one Jumbo sells another.

There is some valuable territory now open for aggressive dealers who want to build a lasting, profitable connection.

Write for facts and territory

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SAGINAW MICHIGAN

JOHN SIMMONS CO., 102-110 Center St., N. Y. C.
Eastern Distributors and Export Representatives

Do You Own a "Fairweather" or an "All-Weather" Ford?

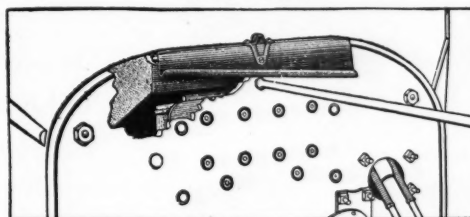
Do you use an unsightly, leaky, cumbersome apron as a coil protector; a metal one that short-circuits the ignition; stay under cover when it rains; or take chances and get "stuck?"

If you drive a 1917 or later model Ford you take chances without a

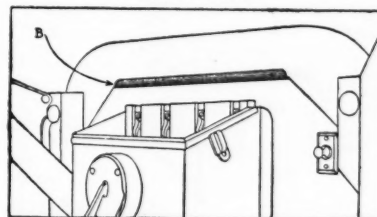


a one-piece metal coil protector that fits under the body, over the dash and under the hood.

FRONT VIEW



BACK VIEW



ABSOLUTELY GUARANTEED TO MAKE YOUR FORD WATERPROOF IN FRONT AND BACK OF THE DASH. Cannot rattle, work out of place or short-circuit the ignition. Will not interfere with the removal or replacement of the coil box cover, coils, or coil box, nor with the raising, lowering or removal of the hood. **OUT OF SIGHT.** Anyone can install in ten minutes by following simple instructions printed on each protector.

Price 50c each

Supplied to the trade through legitimate jobbers.

DEALERS: Write direct if your jobber cannot supply you.

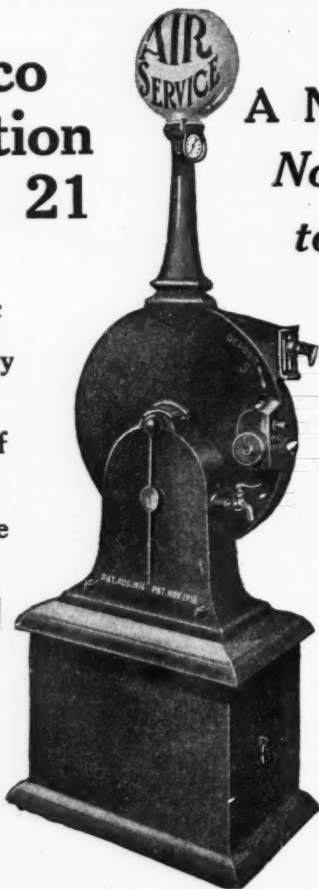
FORD OWNERS: If your dealer has not stocked "BONE DRY" we will mail postpaid upon receipt of price.

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AMERICAN AUTO PRODUCTS CO.
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Which Would You Rather Do —Put Money In Your Business Or Take It Out?

**Eco
Station
No. 21**

One of
the many
ECO
types of
Station
available
to
suit
your
needs



**A New One—
Now Ready
to Install**

It pays
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about all
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ECO
Installations
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Prepayment Air Stations More Than Save the Loss "Free Air" Is Sure to Cost

Purely from a standpoint of good business, consider the advisability not only of eliminating the expense of a service you have called "Free Air"—but of substituting in its place another service that accomplishes the same thing at a profit.

Small business men have grown big—big business men have become famous through the principle which is the basis for the use of ECO Prepayment Stations for dispensing air: cash for service rendered.

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Statement of the Ownership, Management, Circulation, Etc. Required by the Act of Congress of August 24, 1912

Of **MOTOR AGE** published Every Thursday
at **Chicago, Illinois** for Oct. 1st 1919.
STATE OF **Illinois** ss.
COUNTY OF **Cook**

Before me, a Notary Public in and for the State and county aforesaid, personally appeared **E. E. Haight**, who, having been duly sworn according to law, deposes and says that he is the **Manager** of the **MOTOR AGE**, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher **THE CLASS JOURNAL COMPANY**, Malters Bldg., Chicago, Illinois.
Editor **Darwin S. Hatch**, Malters Bldg., Chicago, Illinois.
Managing Editor **David Beecroft**, 239 West 39th St., New York, N. Y.
Business Manager **E. E. Haight**, Malters Bldg., Chicago, Illinois.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

UNITED PUBLISHERS CORPORATION: Stock Holders—Chas. K. Beldenkopf, 230 W. 39th St., New York; Edmund D. Carey, 239 W. 39th St., New York; Fritz J. Frank, 239 W. 39th St., New York; Geo. H. Griffiths, 239 W. 39th St., New York; W. H. Lindsey, 231 W. 39th St., New York; James H. McGraw, Jr., 10th Ave. and 36th St., New York; Elizabeth S. McKel, 80 Upper Mountain Ave., Montclair, N. J.; C. G. Phillips, 171 Cooper Ave., Upper Montclair, N. J.; Jennie M. Phillips, 171 Cooper Ave., Upper Montclair, N. J.; Chas. Swayne Phillips, 231 W. 39th St., New York; W. I. Ralph, 231 W. 39th St., New York; F. T. Root, Bronxville, New York; Olive Root, Bronxville, New York; Winifred Root, New York City; Chas. T. Root, New York City; E. J. Rosencrans, 243 W. 39th St., New York; G. Eugene Sly, 231 W. 39th St., New York; H. M. Swetland, Montclair, N. J.; W. H. Taylor, Upper Montclair, N. J.; Everett B. Terhune, 207 South Street, Boston, Mass.; A. C. Pearson, 231 W. 39th St., New York; M. J. Swetland, Trustee for Grace Swetland, Montclair, N. J.

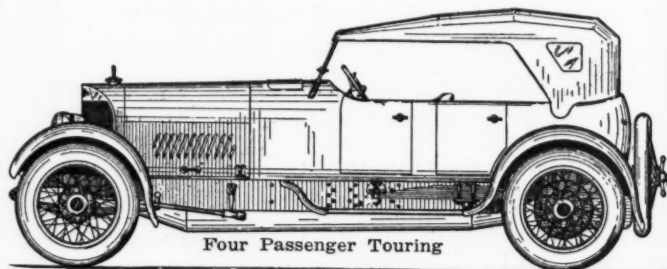
3. That the known bondholders, mortgages, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) **NONE**.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

E. E. HAIGHT, Manager.

Sworn to and subscribed before me this **Twenty-ninth** day of **September**, 1919.

MARGARET I. WILSON,
[SEAL] (My commission expires September 9, 1932.)



Four Passenger Touring



Singer



Unexcelled in superb finish and skilled workmanship.

A motor car distinguished from all others in design throughout. A pleasure vehicle for those who discriminate and demand distinctiveness.

We specialize in individual design.

Open models \$5000.00; closed models \$7200.00 and up.

Agency inquiries given prompt consideration.

SINGER MOTOR CO., INC.

North Third Ave., Mount Vernon, N. Y.

THIS IS THE DEVICE Which Automatically PROTECTS YOUR CAR

*It Does Not Forget or
Become Confused*



It may be up to the man behind to guess when you are going to stop or turn—but that doesn't save your car or your life if he fails to do so.



ILLUMINATED AT NIGHT

\$15—COMPLETE—\$15

SOME ESPECIALLY DESIRABLE TERRITORY

still open for

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THE AUTO INDICATOR COMPANY

207-217 Ottawa Ave., N. W.

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HAYWOOD'S LATEST INVENTION

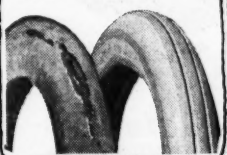


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A new machine that will earn from \$100.00 to \$150.00 per week in any well established tire repair shop. More than one year of constant experimenting and development work was required to complete it.

Statistics say there will be *One Billion Dollars* worth of tires worn out this year. The insistent demand for re-treaded tires that would add 3,000 to 4,000 more miles of wear is growing. A new and better machine than had so far been produced was needed.

Two actual photographs of One Tire
BEFORE and AFTER
being repaired and re-treaded on a silvur-lined mold.



HAYWOOD'S
Silvur-Lined
MOLD

meets the need. Made of white metal—die cast—absolutely free from blemishes and smooth as glass. It is truly a wonderful machine.

Old tires retreaded on this machine closely imitate the runner, cord type, and are smooth, classy, bright. All 4,000 owners of Haywood Tire Repair plants will want this new Haywood invention. Owners of other plants should have one.

Pays for Itself in a Week

Will earn from \$100.00 to \$150.00 weekly. Are you an auto tire repairman? If you are not, why not enter this profitable business? Tire Repairmen earn \$2,500 to \$4,000 Per Year. Many are doing better; some up to \$6,000 and \$7,000 per year. If you have a tire repair shop, you need this Haywood Silvur-Lined Retread Mold. You should write us at once and get the details. It will pay for itself in a week. Every week thereafter you should make \$100.00 or more extra profit.

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I have an interesting book to send you that tells about tire repairmen and the Haywood method. It tells about automobile tires—it gives inside facts that you should know about profits. When you write tell me if you have a tire repair shop, or, if you want facts about the tire repair business. Address

M. HAYWOOD,

Haywood Tire & Equipment Co.
1228 No. Capitol Ave., Indianapolis, Ind.

WRITE ME: I will tell you how to start in business as an expert tire repairman and earn \$2,500 to \$4,000 per year. Sounds too good to be true. But it is true, every word of it.

M. HAYWOOD,
Haywood Tire & Equipment Co.
1228 No. Capitol Ave.,
Indianapolis, Ind.

(Mark an X for interest in either or both subjects)
☐ Send facts about the Silvur-Lined Mold.
☐ Send facts about the Tire Repair business.

Name.....

Address.....

N. E. Gibbard, Charlotte, Mich., owner of a Haywood plant, last year did a business of \$15,000. Charlotte is a town of 7500 population.



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WE ARE THE ORIGINATORS OF THE SERVICE STATION PLAN WHICH PUT THE CONTACT AND BRUSH REPAIR BUSINESS ON A SYSTEMATIC PAYING BASIS. WRITE FOR CONTRACT AND GET ONE OF OUR CASH REGISTERS OF CONTACT PARTS FREE IF YOU DO ANY MAGNETO REPAIRING YOU WILL NEED THE DEFECTOMETER FOR ACCURACY IN LOCATING MAGNETO SHORTS. IT QUICKLY PAYS FOR ITSELF.

PAUL G. NIEHOFF & CO. INC. 232-242 E. OHIO ST. CHICAGO, U.S.A.
METALLURGICAL AND ELECTRICAL LABORATORIES

ATTENTION

We wish to
ANNOUNCE
that we now do all
kinds of expert ar-
mature rewinding
♥ **QUICK SERVICE** ♥

20,000 Miles Without a Puncture

That is the remarkable report a man sends to us. He used the same air that was pumped into the tube when put on.
Written Guarantee for 10,000 Miles



BRICTSON PNEUMATIC 10,000-Mile Tires eliminate all tire troubles because they are—

**PUNCTURE PROOF
BLOW-OUT PROOF
SKID PROOF
RUT PROOF**

**RIM-CUT PROOF
OIL PROOF
GASOLINE PROOF
TROUBLE PROOF**

Run through glass, nails, tin cans, ruts, oil, over slippery streets—it makes no difference.

BRICTSON Tires are the outcome of ten years of rigid testing. They are proving a revelation in the tire world for the good reason that they solve all tire problems.

Enthusiastic Reports

One man says he has run 18 months without a puncture or other tire trouble. Another says he has forgotten what tire trouble is. One writes that he never takes his tires off only to paint his wheels. Still another says that he has no use for chains since using **BRICTSON Tires**, which do not skid.

Can You do this
with Your Tires?

Try 'Em First—Then Pay!

Has a tire manufacturer ever offered you as much? Neither could we if years of testing had not proven beyond all doubt that **BRICTSON 10,000-Mile Tires** are the complete perfection—the final word in tire construction. And we want YOU to try **BRICTSON Pneumatic 10,000-Mile Tires** at our expense.

FREE TRIAL COUPON

BRICTSON MFG. CO.
Dept. 12-109 Omaha, Nebr.

Please send to me by return mail, the details of your FREE TRIAL OFFER and complete information about **BRICTSON 10,000-Mile Tires**.

Name _____
Street, P. O. Box or R.F.D. _____
Town _____ State _____
I use _____ tires
Give Size _____

Your inevitable delight and enthusiasm over the results of this trial is our assurance of your satisfaction.

Don't bother about writing a letter. Just clip the coupon at left, fill it in and mail to us **TODAY**. It puts you under no obligation.

Brictson Manufacturing Co.

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NEW DOVER Flexo Combination Measure and Funnel

Heavily Copper Plated



Made in 1, 2 and 4-Qt. Sizes

A measure and funnel combined with 8" detachable flexible spout. Easily reach any oil hole or tank without spilling. Send for Catalog

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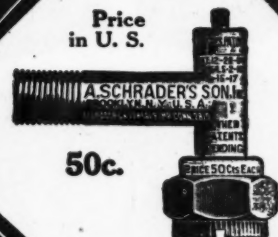
Cambridge, Mass.,

U. S. A.



Is Your Tire Pump Complete

Price
in U. S.



50c.

With a

SCHRADER UNIVERSAL PUMP CONNECTION

attached to your tire pump you are saved the labor of pumping your tires up beyond the required pressure. It permits the measuring of the inflation without disconnecting the pump and the tire.

A. SCHRADER'S SON, Inc.

785-793 Atlantic Avenue

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Protect Against Dust, Dirt, Moisture and Cold

GARAGE MAN, HERE IS A REAL BET!

Here is a brand new way to keep your garage filled to its capacity this winter—and, in addition, to get the profitable accessory and repair business that will naturally follow.

For a practically nominal investment you can buy a Kennedy Cover for every car in your garage. Just stop and think how your boarders will appreciate having their cars protected from dust, dirt, rust and cold, with a Kennedy Cover when their cars are standing on the garage floor and for permanent winter storage, you cannot beat Kennedy Covers.

Besides, many owners who keep their cars in private garages will jump at the opportunity of getting a Kennedy Cover. KENNEDY re-sale business pays.

Write today for sizes and prices

THE KENNEDY CAR LINER & BAG CO.
SHELBYVILLE INDIANA

**THE ONLY
SCREW HOLES
IN THE WORLD**

You drive the screw holes with a hammer in any material.

The screw holes are made for wood screws or machine screws to fit all sizes of screws. The head is removed and you leave a permanent screw hole.

The Stine Screw Holes Co.
Manufacturers
WATERBURY, CONN., U. S. A.
DEPARTMENT 5

Once a Screw Hole, Always a Screw Hole

The Biggest Little Thing in the World

Some of the Reasons Why Screw Holes Will Be Bought and Used and Not Become Dead Stock for Anyone

- 1—They can be used without damage to receiving material.
- 2—They enable you to standardize to wood or machine screws in all material.
- 3—They are made of brass and will not rust under atmospheric or moisture conditions.
- 4—ECONOMY—They save more time value than the holes cost.
- 5—You get them for nothing and are paid for using them when you count time saved.
- 6—Screw holes have been needed ever since the first screw was used.
- 7—Special tools are NOT needed in using them in any material.
- 8—They can be used in any place a screw can be used.
- 9—By using screw holes, screws can be used in many places, and in many materials where it is impossible to use screws without them.
- 10—These are the only ready-made screw holes in the world.
- 11—No special screws are needed. These screw holes fit any wood screw or machine screw now in stock.
- 12—They make the neatest possible job in any material.
- 13—Every store where screws are sold must carry them in stock, because the line of screws is not complete without screw holes for them.
- 14—Every shop and factory where screws are used must also have these screw holes to fit the screws.
- 15—They are endorsed by all dealers in screws and by all users of screws.
- 16—Screw holes are entirely new and the world supply is yet to be furnished.
- 17—This is a progressive Old World of ours; and every active person in it must adopt all improved methods, and all new articles that will help him keep in the front line of progress.
- 18—Be among the first to stock up in screw holes if you are a dealer in screws.
- 19—Be among the first to install screw holes in your shop or factory, as you begin to save money soon as you use them.
- 20—In spite of the high cost of brass, screw holes are yet cheap.
- 21—We are letting the world know that screw holes can now be secured, by means of extensive advertising in all the principal Trade Journals that have the largest circulation among dealers in screws as well as users of screws.
- 22—Do not let your customer ask you for screw holes before you have them in stock. BE A LIVE WIRE.
- 23—They make everlasting holes in any material.
- 24—They mean "Plug-No-More" screw holes.
- 25—They are the result of Necessity being The Mother of Invention.
- 26—Anyone who can drive a nail can use screw holes.
- 27—Send for a sample and convince yourself.
- 28—Mechanics who see them say, "What do you think of that?"
- 29—In fact there are NO REASONS why screw holes should NOT be used.

Each of these reasons are enough to sell Screw Holes. There are many other reasons.

Write at once for our handsome Color Card showing screw holes in various materials which will be sent on request, together with samples and price list.

When FORDS Don't Rattle-



Stillling rattles only by putting the car to bed o' nights is mighty unsatisfying. That's why you'll take to the Fernald Silencers—the trio of simple little devices that knock out noises—and other kinds of trouble, too.

FERNALD STEER-AIDS

Quiet rattling steering rods, eliminate wheel wobbles, save bushings, cut down front tire wear and prevent a heap of skidding. Used on other light cars as well as on Fords. 50 cents a pair.

LITTLE B-R-A-T-S

are for noisy brake rods—spare you wear as well as racket. Attached in a jiffy. Originally designed for Fords but can be used on 90% of all makes of cars. Set of 4 for 50c.

Auto Door Anti-Rattlers

kill the clack of rattling doors. Attached in a minute with an ordinary screw driver. 35c a pair.

DEALERS—Don't despise the day of small things. There's money for you in the quick turnovers Fernalds make.

FERNALD MFG. CO., Inc.
NORTH EAST, PA.

Service Stations & Garagemen Big worth-while profits with astonishing increase of trade

immediately follows your taking on

NEW YORK REPLACEMENT IGNITION COILS

Unless you are already handling our REPLACEMENT IGNITION COILS you cannot realize the tremendous existing demand—they are not in the class of ordinary accessories. They must be procured immediately when coil troubles occur.

Fifteen years' coil building experience enables us to produce a coil that gives a crashing big, hot spark, even when battery is low, which insures easy starting, perfect running and full power from present day gas.

No article ever supplied the automobile industry has proven more beneficial alike to Dealer, Jobber and user. We make a coil for every car, that is guaranteed for all time.

Circular showing how to order for each model car with prices and other information upon request.



TYPE A

NEW YORK COIL COMPANY
338-340 Pearl Street, New York, N. Y.

TIRES

ECONOMY FOR MOTORISTS

TUBES



Slightly used and repaired tires and new tubes of the best known standard makes that mean big cash savings for every car owner.

Size	Tires	New Tubes	Size	Tires	New Tubes
30x3	5.00	1.70	34x4	8.75	2.80
30x3 1/4	6.00	2.10	34x4 1/4	9.25	3.15
32x3 1/2	6.50	2.25	35x4 1/2	9.50	3.25
31x4	7.25	2.50	36x4 1/2	9.75	3.30
32x4	8.00	2.60	35x5	10.50	3.65
33x4	8.75	2.70	37x5	11.00	3.75

For Non-skids add 10% to above prices

COMPLETE STOCK OF NEW TIRES

Write for Prices

Terms: \$1.00 deposit with each tire ordered, balance C. O. D. subject to inspection. Specify style of rim to avoid delay. Although at the above prices these tires bear no mileage guarantee, we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

Special Proposition to Live Dealers

TIRE REPAIR & SUPPLY CO.

Dept. A, 1356 Michigan Ave., Chicago, Ill.
Phone Calumet 47-48-49



Beauty of Glass a Factor in Selling Cars

Manufacturers of automobiles realize the value of beauty as a sales factor. Consequently they demand glass of high quality—at a reasonable price.

Crystal Sheet Glass, while considerably less expensive than plate, possesses every element of beauty and quality essential to high grade automobile construction.

It is strong, uniform in thickness, perfectly transparent, and of the proper degree of flexibility.

Ask us to explain in detail why Crystal Sheet is the logical glass for your cars.

AMERICAN WINDOW GLASS CO.

World's Largest Producer

GENERAL OFFICES: FARMERS BANK BUILDING
Pittsburgh, Pa., U. S. A.

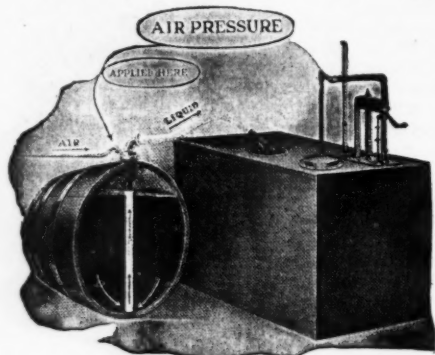
A Real Labor Saver

Empties a Barrel of Oil in 3 Minutes, Without Pumping or Any Work Whatever

Air Pressure Does it All—You just roll the barrel up to the tank and connect the

OPTIMO

Barrel Discharging Bung



No Labor, No Waste, No Slopping

It will prove itself worth many times its price—\$10 complete with 24" length of flexible metal conveyor tubing—

GUARANTEED

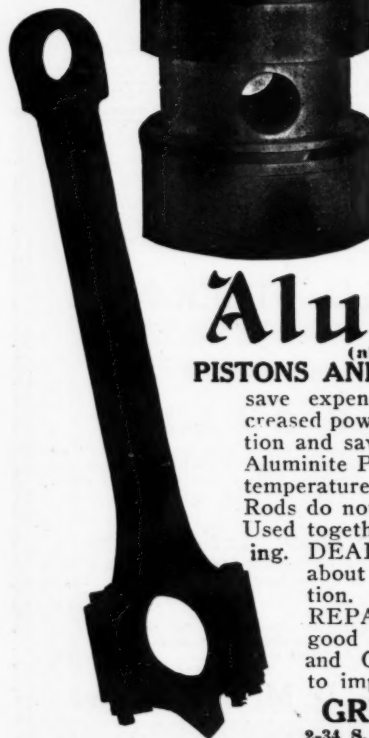
on a "Money Back" Basis to do all we claim for it

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L. A. MORGAN CO., INC.
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All infringements of patent rights and users of such device will be prosecuted.

LIGHT HARD STRONG



Heavy reciprocating parts pound crank pins out of round. Each running hour sees the car headed nearer to another overhauling. The lighter action of

Aluminite

(aluminum alloy)

PISTONS AND CONNECTING RODS

save expensive repair bills, afford increased power and speed, eliminate vibration and save gas.

Aluminite Pistons are unaffected by high temperatures. Aluminite Connecting Rods do not require crank pin bushings. Used together they affect a greater saving.

DEALERS: We want to tell you about our merchandising proposition.

REPAIRMEN: Try to sell the good job first. Aluminite Pistons and Connecting Rods cannot fail to impress your customers.

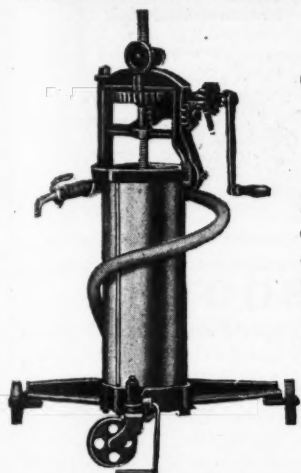
GREEN ENG'R'G CO.

2-34 S. St. Clair St., Dayton, Ohio

For Cylinder Grinding See Our Ad in Clearing House Sec.

Shop Equipment

which will net bigger profits
for every dealer



EKERN'S PORTABLE GARAGE GREASE GUN Models N or K

EKERN MODEL N OR MODEL K
PORTABLE GARAGE GREASE GUNS
ARE

Portable, practical and clean. The EKERN are the only hand-operated guns on the market that will work any weight of grease as well as oil.

Model K holds 20 lbs. grease of 2½ gals. oil.

Model N holds 56 lbs. grease or 7 gals. oil.

So that you may become better acquainted with the "money-making" advantages of our specialties, send for our complete catalog.

Your jobber can fill your order.
Full particulars on request.

H. G. Pano Co. 1419-1414 S. Michigan Ave.
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"Just What I Want"

Everyone says so at a glance, and when once installed in your Garage or Shop you would as soon think of keeping your front doors perpetually locked as doing without an

Automatic Extension Reel

For Electric Lamps

Take your lamp to any part of your Garage or Shop, locking and unlocking at any desired point. Automatically rewinds the cord when you are through with the light.

STRONG AND DURABLE. Send for full particulars and prices. Remember that it is not in any way a "half-baked" proposition nor an amateur outfit, but a splendidly constructed and practical piece of mechanism for men who haven't got time to bother with nonsensical makeshifts. Equipped with 25 feet packinghouse cord, handle, socket and lamp guard.

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Sole Manufacturers and Owners of Patents

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BRANCH OFFICES:

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Send Us Your SCORED CYLINDERS

and cracked water jackets. Our factory nearest you will make these repairs on a 24-hour service basis. Regrinding of cylinders that have been scored by wrist pins or through other causes is unnecessary. The Lawrence Patent Process fuses a silver-nickel alloy into the defects making a quick, clean, permanent job without altering the bore of the cylinder. Same piston and rings fit.

Cracked water jackets are also made permanently good through this same process.

A list of our factories is given below. There is one near you. Send the scored cylinders and cracked water jackets to the nearest plant. There we will insure you quick service and perfect results. Aside from the liberal arrangements we make with you, the money saving service you render your customers will help make you known as a concern that looks after their interests—and this is a business asset in itself.

Write to any of our factories for full information

L. LAWRENCE & CO. Woolworth Bldg.
New York

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Cleveland, 6259 Euclid Ave.	N. Y. C., 791-3 Eleventh Ave.
Detroit, 1246 Jefferson Ave.	Philadelphia, 1601 Sumner St.
Los Angeles, 335 Washington St.	Pittsburgh, 5102 Baum Bldg.
Milwaukee, 18-26 Martin St.	San Francisco, 116 Hyde St.

LICENSEES

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Kansas City, Kans., General Auto Parts Co., Grand Ave.
Lima, O., Buckeye Repair Shop, 133 Water St.
Memphis, J. B. Cook Machine Shop, 294 Washington St.
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Established 1862

A Few Territories Still Open for Licensees

LAWRENCE

PATENT

PROCESS

SCORED CYLINDERS AND
SAND-FAULTS CORRECTED

TRADE
LAWRENCE
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BORE PRECISION MAINTAINED
CYLINDER SCRAPING ABOLISHED

BOKO

PRODUCTS

Manufactured by
Defiance Welding Co. — Defiance, Ohio

Easy Sellers—Big Profit Earners

Every up-to-the-minute garage should carry a good stock of BOKO Buckets.

They sell on sight and offer an opportunity to turn over your investment quickly—and with big profits.

BOKO Buckets for gasoline or water have a capacity of two gallons and may be folded and placed in the kit. These buckets are constructed of gasoline-proof fabric, are double sewed and tightly cemented. The funnel prevents spilling and easily directs flow of contents.

Dealers—Send for full particulars TODAY.



Boko Bucket
Cat. No. 1567
Price \$1.00



Boko Folding Bucket
Price \$1.75

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TRIPLEXD

The Guaranteed Hose

"This Triplexd Hose is Guaranteed to Last a Full Year."

YOU are guaranteed at least one year's service* from every length of TRIPLEXD you buy. With no other gasoline hose at any price are you sure of this. When you specify TRIPLEXD—we see you get the service you pay for.

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The Triple X construction makes possible the TRIPLEXD guarantee. Three plies—metal, fabric and rubber—bound into one.

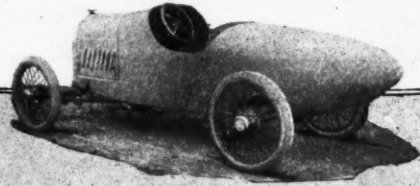
*The average service life of TRIPLEXD Hose is over two years.



Speedway Racing and Sport Models for Fords

HERE IS A DESIGN THAT BEATS THEM ALL. Smart racy lines—expert workmanship, and high grade materials provide a genuine body built for service.

Write for Prices and Complete Description
CRAIG-HUNT, INC.,
910 N. Illinois St., Indianapolis, Ind.



NO-BLO BOOT

A Big Money Making Proposition for Dealers

Something new in blow-out patches! New in design—new in principle. Car owners recognize at once the superiority of the NO-BLO Boot. Made smaller in the center than the inside of the tire actually is, so when the tube is inflated the patch is stretched, fits the tire and relieves the injured part of all strain. This patch holds rim cuts as well as blow-outs, as it is full thickness to the locking edges.

Relieves all strain from the injured part of the tire.

Write for our dealer proposition.

Central Auto Accessories Co.
802 Main St., Peoria, Ill.



Cooper

"SPECIAL" CUTOUT

"Feels the Pulse of the Car"

CORRECTLY
DESIGNED
—
QUALITY
GUARANTEED



EASILY
INSTALLED
—
FITS ANY
CAR

THE COOPER MANUFACTURING COMPANY
Dept. A. Marshalltown, Iowa

Sales Managers—**THE FULTON COMPANY**
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KISSEL TRUCKS

A size
for every
business



INCOMPARABLE engine ability, axles, springs, brakes and frame of the best material, and above all, unexcelled workmanship, characterize KISSEL TRUCKS.

See your nearest Kessel Dealer today

Kissel Motor Car Company. Hartford, Wis., U. S. A.

Makers of Springs and Axles for Heavy Duty
Service for more than Fifty Years



SHELDON AXLE & SPRING CO.
WILKES-BARRE : : : : PENNA.

Speed

Strength

Endurance

ROGERS ALL-STEEL TRAILERS, in all models, styles and sizes (½-ton to 10-ton capacity). Dumping Trailers, 4-wheel and 2-wheel Trailers, Semi-Trailers, highest quality, easiest running, longest lasting.

Write for Catalog and Price List

ROGERS BROTHERS COMPANY

Albion, Pa.



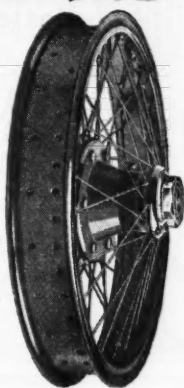
WIRE WHEELS

HOUK

We can supply immediately, sets of Houk Wire Wheels for all the cars listed and any of the service stations below will gladly install them.

Dealers should send at once for the particulars of our service and sales agency proposition.

Buick	Franklin	Oldsmobile
Cadillac	Haynes	Overland
Chalmers	Hudson	Paige
Chandler	Hupp	Scripps-Booth
Chevrolet	Kissel	Studebaker
Cole	Lexington	Stutz
Dodge	Marmon	Vellie
Dort	Maxwell	Westcott
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HOUSE

Set of 5 House Wire Wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, one hub dust cover for spare wheel. White, Black, Red; color optional. For Fords, \$65.
For Chevrolet 490 and Overland Model 4, \$75.

WIRE WHEEL CORPORATION
OF AMERICA

(Successors to Houk Manufacturing Co.)

1700 Elmwood Ave. Buffalo, N. Y.

Direct Factory Branches and Service Stations:

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Philadelphia, 328 N. Broad St.	Los Angeles, 1216 S. Grand Ave.
Chicago, 23rd St. and Indiana Ave.	San Francisco, 1690 Pine St.

Exclusive Canadian Representatives:
Dunlop Tire & Rubber Goods Co., Toronto



FAPCO

FORCE AIR PUMP

Feel the air escaping from an ordinary pump. Then try the Fapco. No air escapes—you pump all the air into the tire with the Fapco in less time with less work.

A Live Proposition for Jobbers and Dealers

The car owner wants it the moment he sees how it works. An intake valve at the top opens and closes with the movement of the piston rod. This traps all the air in the cylinder. So with every complete stroke all the air goes into the tire.

A leather cup in the piston gives perfect compression. Every Fapco has an expansion piston ring which reduces the chance of a leak and increases capacity.

Dealers—If your jobber can't supply you with Fapcos, write us.

Jobbers—Write for sample and terms.

FORCE AIR PUMP CO.
JEFFERSON, IOWA



ATSCO

PORTABLE AIR TANK

The Handiest Article In The Garage

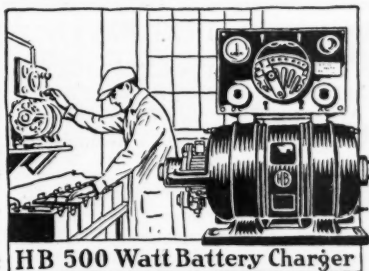
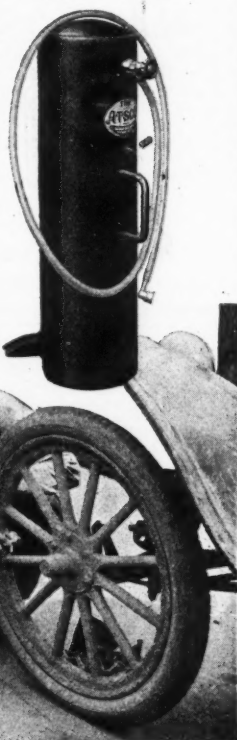
Ask any garage or service station manager and he will tell you that the ATSCO Portable Air Tank is the most convenient and most used article in the shop. It is light, strong and easy to handle. A dandy for quick emergency jobs. Comes complete ready to use. Good for a working pressure of 250 lbs. per square inch, \$24.50 f.o.b. Pittsburgh.

Manufactured only by

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Main Office
and Works
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Tank makers
for nearly 30
years. We
manufacture a
line of gaso-
line storage
tanks & pumps
and a general
line of pres-
sure tanks for
all purposes



HB 500 Watt Battery Charger

\$150.00 PROFIT

every month
from

HB BATTERY CHARGING

Hundreds of garages, large and small, are making profits of \$100 to \$300 a month from HB Battery Charging. YOU can do as well. NOW is the time to start, with fall and winter bringing a tremendous demand for reliable battery charging service. Start RIGHT AWAY—you can make HB Battery Charging your biggest money-maker.

Small Payment puts this Money-Maker
in your Garage—Balance on Easy Terms

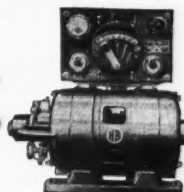
Your profits should easily pay the balance and yield a good surplus besides. This HB 500 watt outfit recharges 1 to 8 6-volt batteries for 10c to 15c each. Customer pays 75c to \$1.50. No repairs, no burn-outs, no renewals—big, steady profits. Absolute Money Back Guarantee. Ten days' free trial. You run no risk. To meet competition, you must offer battery service. Be safe—get an HB Charger. Write TODAY for full information.

HOBART BROS. CO.,

Box A101

Troy, Ohio

Successful Manufacturers since 1893.





Here's a Fan Belt That Will Satisfy Your Trade

They have been looking for a fan belt like this A-B-C Belt—the one that will not grow slick and slim, nor slip and lose power—but grips the pulley tight giving tremendous traction power.

This belt is endless and is treated to withstand heat, oil, water and gas—it gives long service.

Will you sell your trade just what it wants—then stock this A-B-C line. There's quick turnover and good profits for dealers handling the A-B-C Fan Belts, A-B-C Radiator Hose, A-B-C Sheet Packing, A-B-C Brake Lining. Write for discounts and particulars.

AMERICAN BRAKE LINING CO.
Lansdale Penn.

**A-B-C
BRAKE
LINING**



Safety Made
Secure

"J. C. M."

Radius Rod for Fords

J. C. M. Radius Rod

J. C. M. RADIUS RODS are stronger — safer because of the weldless, non-brazed joint. The rods are inserted and clamped into a patented socket—while the axle end of the rods are made unbreakable.

The J. C. M. Auxiliary Brace, shown below, eliminates steering wheel oscillation.

Dealers write for profitable trade proposition.

JERSEY CITY MACHINE CO.
115 Plymouth St.,
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CHARGE YOUR BATTERIES

With The Alternating Current Battery Charger. **ST. LOUIS M. U. RECTIFIER.**

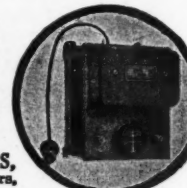
In every community the use of the low voltage storage battery has created a demand for a charging system which can be operated from an alternating current.

THIS CHARGER is simple to operate, and may be hung on the wall or carried to car and connected to any lamp extension.

LOW COST and small operating expense make it suitable to individuals and to garages.

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ST. LOUIS ELECTRICAL WORKS,
Mfg's of Motor Generator Sets, A. C. Motors,
Magnetizers and Magneto Testers.
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Stop Worrying About Fire and Explosion! Equip Your Car with



The time-proved receptacle endorsed by big automotive engineers. The finest seamless drawn steel, tinned and tested—absolutely leakless—they carry your "gas" as it should be carried

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Main Office, Philadelphia
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HENRY'S PERFECTFIX PRODUCTS



A SELF-VULCANIZING PRODUCT FOR REPAIRING TUBES AND TIRES. No Heat or Tools required to complete a permanent and everlasting repair.

Motorists are convinced upon the first trial that Perfectfix is their greatest necessity at all times.

Perfectfix is recommended everywhere, therefore a great demand.

You will need your supply immediately. Order today! Price-lists mailed upon request.

Manufactured and Guaranteed by
HENRY J. DEWITZ CO. MILWAUKEE, WIS.

UNIVERSAL Offset Speed WRENCH

Pat. Pend.



Removes the FORD FOURTH CONNECTING ROD NUT in three minutes. Made strong—all steel, 3-inch offset. Sent prepaid for \$5.00. Ask your jobber. If he can't supply you, write us.

Sawyer Sales Company

580 Terminal Building,
LINCOLN, NEB.

TRUCK AND TRACTOR MANUFACTURERS
Write for the Facts About

Waukesha

4-CYLINDER MOTORS

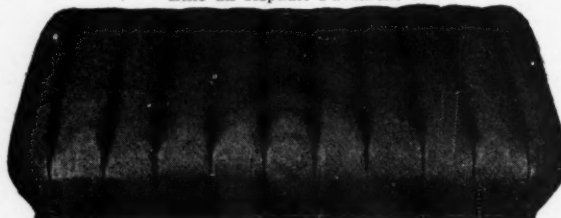
The Product of an Organization
Whose One Aim Has Been to Put
Character Into Their Product.

WAUKESHA MOTOR CO.
WAUKESHA, WIS.

Make Your Ford Ride Like a Packard or Pierce Arrow
with a

Cathedral Pipe Deluxe Cushion

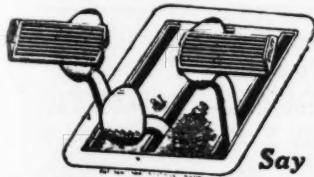
The Only Cushion in America That Makes All Kinds of Roads Seem
Like an Asphalt Pavement



No Shock Absorbers Necessary. Sold Under a Positive Guarantee to
Make Your Car Ride 100 Per Cent Better or Your Money Back.

Let Us Tell You More About It.

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Jobbers Dealers "An Absolute Necessity"

Say Users Referring to

UTILITY Pedals for Fords

UTILITY Pedals are the most necessary accessories for Ford Cars. Users say so, and they sell in proportion to this demand.

Dealers—order from your jobbers.
Jobbers—get in touch with us.

HILL PUMP VALVE COMPANY
Mfrs. of UTILITY Products

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Sales Dept., THE ZINKE Co., 1323 S. Michigan Av., Chicago

Price
\$1.25



The Standard Vulcanizer Equipment for Repair Shop Use

A complete line, covering every requirement of the trade.
—Vulcanizers, Retreaders, Tube Plates, Steam Boilers, Tools, etc.
Write today for descriptive literature.

THE AKRON RUBBER MOLD & MACHINE CO.

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For sale on the Pacific Coast by
Rubber Products & Machy. Co.,
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AKRON-RUBBERMOLD TIRE REPAIR EQUIPMENT



OVERALL SUITS That Are Comfortable

PROTEXALL Overall Suits, designed by experts, have a special spring back that eliminates all strain. No matter what position you are in while working on the car, you are always comfortable. PROTEXALL Overall Suits allow absolute freedom of movement and never bind.

Large, roomy pockets for your tools. Made of khaki, a material that stands rough usage and resists wear. Farmers, motorists, mechanics—all tradesmen—are highly pleased with this one-piece suit.

DEALERS—Protexall Suits are sold only through jobbers. Write direct if he cannot supply you.

THE PROTEXALL CO., Abingdon, Illinois

SCHEBLER CARBURETOR

AT ANY OF THE FOLLOWING BRANCHES OR SERVICE STATIONS

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Minn.; Interstate Electric Co., New Orleans, La.; Schebler Carburetor Co., Inc., 1777 Broadway, New York City, N. Y.; Manufacturers' Supplies Co., Philadelphia, Pa.; The Automobile Accessories Co., Pittsburgh, Pa.; Ballou & Wright, Portland, Ore., and Seattle, Wash.; Fred Campbell Auto Supply Co., St. Louis, Mo.; Weinstock-Nichols Co., San Francisco, Los Angeles, Oakland, Calif.; Canadian Fairbanks-Morse Co., All principal Canadian Cities.

THE WHEELER-SCHEBLER CARBURETOR CO., INC.
INDIANAPOLIS · INDIANA



"IT NEVER LETS GO"

PARA-BOND is the tire patch you are going to use eventually.

Auto owners are fast learning it's the best their money can buy. Jobbers and Dealers make bigger profit with quicker turnover.

Write now for liberal Free Goods Proposition.

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Incorporated
47 Court Street
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Steel Castings

Electric or Converter

Capacity, 100 tons daily. Highest quality castings. Prompt service. Unexcelled shipping facilities. Send blue-prints for quotations.

"MASTODON" TRACTOR HOOF

will give your Tractor more traction. Write.

THE STANDARD STEEL CASTINGS COMPANY

10 S. Michigan Ave., Chicago, Ill.

Foundries: Cleveland—Chicago

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ORDER
BY THE NAME

The original blue sheet. An ideal compressed asbestos packing for any joint. Tenax is permanent whether subjected to gas engine exhaust, cylinder explosions, acid, alkali, superheated steam or any other active agent. Can't burn, rot or squeeze out.

The finest packing made for Automobiles, Tractors, Gas Engines and Steam Engines. Sheets 60 inches square. Thickness 1/32 inch to 1/4 inch, inclusive. Made also in 1/64 inch thickness, black graphited sheet only.

Pack with Tenax and forget the joint forever. Write now for our New Automotive Supplies Catalog or ask your Supply House.

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STA-TITE PISTON RINGS



ELIMINATE
ALL PISTON
RING TROUBLES

THE RING COMPANY
SPECIALISTS IN PISTON RINGS
"MUSKOGEE" "NICHIGAN"



THE Mercer shield is the badge of fastidious taste in automobile. Mercer means the utmost in substantial smartness, riding comfort, and power. The possessor of a Mercer invariably feels a bit better satisfied than the owner of another car. Correspondence from dealers invited.

Mercer Automobile Company, Trenton, N.J.
800 Whitehead Road

NELSON TRACTOR

FOUR-WHEEL-DRIVE

This sturdy, successful tractor embodies many unusual features. It is making money for both dealers and users. Three models:

15-24, \$1765 20-28, \$2800 35-50, \$4000

Investigate—Act Today

CHICAGO **NELSON CORPORATION** BOSTON
SUBSIDIARY COMPANIES
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MOLTRUP'S

Absolutely Accurate Crankshaft Machining

Unless you are absolutely satisfied with the crankshaft machining you are now getting it would pay you to investigate our ability and equipment

"MOLTRUP FOR QUALITY"

Moltrup Steel Products Co. Beaver Falls, Pa.



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Equipment and Supplies
for the

**MOTOR CAR—TRUCK—TRACTOR
MOTOR-BOAT—AEROPLANE**

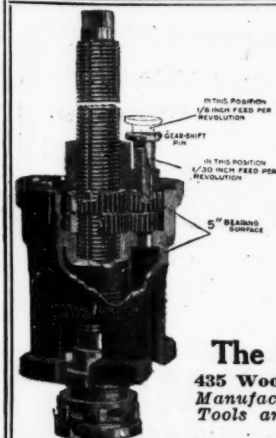
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First Street—Ashley to O'Fallon ST. LOUIS, MO.

FIRESTONE DEMOUNTABLE RIMS



THE Universal Cylinder Re-boring Tool has been tested out and adopted as standard equipment by the manufacturers of this country's finest motor cars.

These men have put the Universal Re-boring Tool through every severe test that their engineers could devise—and the tool made good consistently. You need it in your business. See current issue Automobile Trade Directory and Chilton's Automobile Directory for list of jobbers carrying stock.

Write for Catalog

The Universal Tool Co., Inc.

435 Woodward Ave. Detroit, U. S. A.
Manufacturers of Universal Cylinder Re-boring
Tools and Ford and Fordson Main Bearing
Replacement Equipment

ECLIPSE

BENDIX DRIVE

for electric starters

AUTOMATIC ENGAGING AND DISENGAGING

Used by

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Red Head



Spark Plugs

the kind with the
Vitristone insulator

more spark! less gas!

Red Head Spark Plug Corporation
261 Broadway - New York City



Free From Oil means fewer punctures, increased mileage and less repairs. The Curtis Air Compressor is the only one that can't flood the cylinder with oil, because of exclusive mechanical safeguards.

Costs Little—Minimum Upkeep

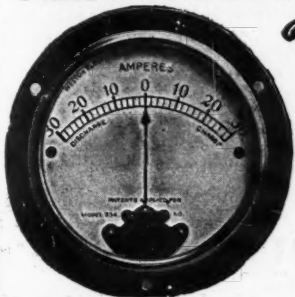
Made in 5 sizes and 125 combinations. Costs no more than any other kind.

Write for our generous offer and full particulars, or ask your jobber for prices—but be sure and call it by name—Curtis—to avoid substitution.

CURTIS PNEUMATIC MACH. CO., 1527A Kienlen Ave., St. Louis, Mo.
Branch Office: 530-H Hudson Terminal, New York

Don't Take a Long Chance

on the condition of your storage battery. It is too late, after it goes dead, to wish you had had proper warning that your "juice" was running low. There is one sure and dependable way of knowing whether your generator is working and your battery receiving its proper charge. Put a



Weston

MODEL 354 AMMETER
on Your Dashboard or Cowl
and you will have the only absolutely reliable means of knowing whether you are maintaining the proper condition of your battery. Don't fool with unknown substitutes! Write us.

Weston Electrical Instrument Co.,
10 Weston Ave., Newark, N. J.
Branch Offices in the Larger Cities

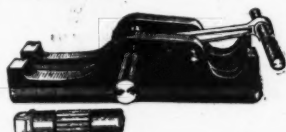


Moore's Compensator

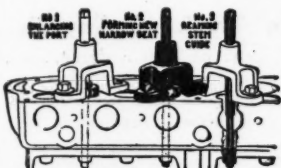
can be applied with perfect success on Buick, Oakland, Oldsmobile, Scripps - Booth and Chevrolet motors, reducing valve mechanism noises to a marked degree, giving to your motor a smooth, even tone.

When attached to upper part of valve stem reduces the noise in any overhead valve motor by equalizing the lost motion between the valve stem and the rocker arm.

WM. H. BLODGETT, Distributor
DECATUR GEORGIA



STORM Connecting Rod Bearing Reamer, Jig and Gauge.



STORM Valve Port Renewing Outfit.

STORM MONEY MAKING TIME SAVING TOOLS

Are absolute necessities in every repair shop.

Our line includes:
STORM Cylinder Reboring Machines.

STORM Connecting Rod Tools.

STORM Main Bearing Babbiting and Boring Tools.

STORM Piston Vise and Piston Service.

Write today for Bulletin No. A42 which gives full information.

STORM MFG. CO.

406 6th Ave., South
Minneapolis, Minn.

For Fall and Winter

NON-FLUID OIL

In Gears Won't Harden or Freeze

Our scientific process makes NON-FLUID OIL adhesive and preserves uniform density without loss of lubricating value.

Use K-00 Special for Gears; K-000 for All Bearings.

NEW YORK & NEW JERSEY LUBRICANT CO.
165 Broadway, New York



STARTING LIGHTING SYSTEMS

THE DYNETO shows greatest efficiency in both motor and generator. Type D. A. Motor develops a torque of approximately 15 pounds. Type C. A. Generator shows approximately 15 amperes.

A car-speed of 15 to 20 M. P. H. keeps batteries fully charged.

Starter always sure to start.

Lamps always bright.

Send drawings and specifications for our recommendation.

Special Outfits for Fords

DYNETO ELECTRIC CORPORATION, Syracuse, N. Y.



JORGENSEN VAPOR PRIMER

It Vaporizes the Starting Charge

Universally accepted the standard primer for motor trucks, tractors, passenger cars, airplanes and motor boats. The most perfectly constructed and most efficient primer on the market.

Write for free descriptive folder

JORGENSEN MFG. COMPANY
Waupaca, Wis.

"Sterling" Universal Joint

Designed and built for passenger automobiles and trucks
A Joint typical of its name

The BEARINGS COMPANY OF AMERICA

LANCASTER, PENNA.

Western Sales Office

1012 Ford Building, Detroit, Mich.

ZENITH



CARBURETOR SUPREMACY

In carburetor Simplicity, Power Reliability and Economy is based upon certain proven facts—well-known to ZENITH users.

ZENITH CARBURETOR CO.
New York DETROIT Chicago

DOUBLES TIRE MILEAGE

Fisher Rim Grip Sub Casings give from 2,000 to 4,000 extra miles from tires, hold all the pressure of inflated tube, completely reinforce all parts of tire, prevent blowouts. Made of piles of finest grade rubberized fabric with pure rubber outside layer.

Dealers: Liberal Discounts make it worth your while selling them. Write us today.

**FISHER
MFG.
COMPANY**
Lincoln,
Nebraska

THE **Fisher**
RIM-GRIP SUB-
CASING



YOUR OPPORTUNITY

Canceled Government Contracts

We have secured a large quantity of Small Motors, Generators and Charging Outlets. This material is new, still in original boxes and carries the full factory guarantee. **This is Your Opportunity to buy new, guaranteed Electrical Apparatus of Standard Manufacture**



Battery Charging Outlets
For use on 110 volt, A. C. 10
amps, single phase current only
each \$48.50
10 ampere

100 watts, 20 volts, 5 ampere \$68.50

100 watts, 12 volts, 10 ampere \$68.50

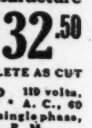
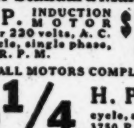
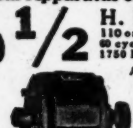
200 watts, 20 volts, 10 ampere \$94.50

All units complete with switch-
board or not shown.

POLYPHASE MOTORS 1/2 HP. to 10 HP.
2, 3 or 4 phase. Complete with switch-
board and motor. I.E.F. \$125.00 I.E.F. \$150.00

NEW MOTORS 1/2 HP. to 10 HP.
2, 3 or 4 phase. Complete with switch-
board and motor. I.E.F. \$125.00 I.E.F. \$150.00

CHAS. H. JOHNSTON



Mail \$1.00 cash or Money
Order. We will send C.O.D.
subject to full examination.
MONEY BACK Guarantee.
Shipment in Motor and Generator.

Write for Catalogue

NEW MOTORS 1/2 HP. to 10 HP.
2, 3 or 4 phase. Complete with switch-
board and motor. I.E.F. \$125.00 I.E.F. \$150.00

CHAS. H. JOHNSTON

West End

1 1/2 H. P. MOTOR \$32.50
110 or 230 volts, A. C.
60 cycle, single phase,
1750 R. P. M.

1 1/4 H. P. MOTOR \$18.50
110 or 230 volts, A. C.
60 cycle, single phase,
1750 R. P. M.

NEW MOTORS 1/2 HP. to 10 HP.
2, 3 or 4 phase. Complete with switch-
board and motor. I.E.F. \$125.00 I.E.F. \$150.00

CHAS. H. JOHNSTON

West End

ALL MOTORS COMPLETE AS CUT
H. P. 110 volts, A. C. 60
cycle, single phase,
1750 R. P. M.

WASHING MACHINE MOTOR
Suitable for operating
Small Washers,
Cafe Grinders,
Bottle Washers,
Lathes, Ball Presses,
etc.

REPULSION MOTORS 1/2 HP. to 10 HP.
2, 3 or 4 phase. Complete with switch-
board and motor. I.E.F. \$125.00 I.E.F. \$150.00

CHAS. H. JOHNSTON

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1 1/2 H. P. MOTOR \$32.50
110 or 230 volts, A. C.
60 cycle, single phase,
1750 R. P. M.

1 1/4 H. P. MOTOR \$18.50
110 or 230 volts, A. C.
60 cycle, single phase,
1750 R. P. M.

NEW MOTORS 1/2 HP. to 10 HP.
2, 3 or 4 phase. Complete with switch-
board and motor. I.E.F. \$125.00 I.E.F. \$150.00

CHAS. H. JOHNSTON

West End

PITTSBURGH, PA.



Dealers! Garage Men! Repair Men!

Investigate the Le Bron Buffer and Power Plant. Air outfit connected if desired. 2, 3 and 5 H.P., any voltage; dust-proof and ball bearing motor.

USERS: This outfit will pay for itself immediately

Dealers: Get our liberal proposition

Write for prices and information

Le Bron Electrical Works
318 South 12th Street, OMAHA, NEBR.



E. & W. TRUCK UNITS

Make A 1, 2 or 3 Ton Truck of Any Car

Furnished with either internal gear or worm drive, cab, body and unit complete are sold to fit any make car. Any wheelbase to 180 inches. 14 foot one-piece frame. We have an unusual and profitable proposition for dealers. Write for details.

E. & W. Mfg. Company,
400 Oregon St., Milwaukee, Wis.

The Brewer Titchener Corp. Makers of Standard Body Parts



Curtain fasteners — well made and at moderate prices. Regularly supplied in Brass—also in polished brass, japanned on brass, oxidized brass, white or black nickel finish. Write for catalog and prices.



Cortland,

New York



BATTERY SHOP EQUIPMENT

Ambu Electric Trouble Shooter. Locates and diagnoses the trouble in the Starting and Lighting system of any Motor Car, 1911 to 1920. Saves hours of time

Cadmium Tester: Leads and voltmeter—simplest, easiest means of testing battery plate. Sets—complete—\$25.

Armature Testing Outfit: Locates and tells any trouble in Armature of starting motors or generators—no delicately adjusted mechanism—\$30.

Battery Steamer: Softens compound for quick easy opening batteries. \$25. With Condenser for distilled water, \$35.

Plate Press: Doubles the life of battery plates—Acid resisting finished wood—Keeps acid from floor—Complete, \$32.50.

Wiring Diagrams: 700 Loose leaf diagrams. Send for free list. 25c each.

Battery Carriers: One man carries 2 batteries easily. Pair \$2.50.

ORDER FROM ANY LIVE JOBBER—OR DIRECT
AMERICAN BUREAU OF ENGINEERING, 1605 Michigan Ave., CHICAGO

**More Speed
Less Spending**

INSTALLATION of a New Stromberg Carburetor on your car will "kill two motoring evils with one stone"—excessive fuel costs and lack of full, quick speed development. The many world speed acceleration, easy starting and power records captured by the New Stromberg Carburetor prove it best on any car for ordinary or most exhaustive road "trials." Send the name, model and year of your car for money-saving, mile-making information.

Stromberg Motor Devices Co.
Dept. 127, 64 East 25th St., Chicago

New STROMBERG Does it!
CARBURETOR

ATWATER KENT

AUTOMOTIVE EQUIPMENT

Ignition
Starting and Lighting

ATWATER KENT MFG. COMPANY Philadelphia

Steel Tires & Mud Chains



Steel Tires & Mud Chains

Try 2 or 3 sections over any old blowout. Can't have blowouts, punctures; neither can the rubber wear off.

Anti-Skid
Mud chains can be put on in a jiffy with one hand while standing on the running board. Hook the ends together and push the little lever. If you get in a mud hole you will laugh out loud.

Kimball Tire Case Co., 173 Broadway, Council Bluffs, Ia.

**GOODELL
PRATT**
1500 GOOD TOOLS

Twenty-five years of specializing in the manufacture of mechanics' tools has developed our line of over 1500 Good Tools, a few of which are listed here. Send for complete catalog.

Amateur Bench Lathes, Bearing Scrapers, Bench Drills, Bench Grinders, Breast Drills, Chucks, Hack Saws, Hand Drills, Motor Sets, Screwdrivers, Valve Grinders, Wrenches.

Goodell-Pratt Company

Toolsmiths

Greenfield,

Mass., U. S. A.

"DEFIES TIME AND THE ELEMENTS"

CHASE DREDNAUT Motor Topping

Write for Samples and Particulars

L. C. CHASE & CO., BOSTON

New York

San Francisco

Detroit

Chicago

JACKSON TRAILERS



A complete line of trailers at all prices, for all purposes.

An unusually interesting dealers' proposition. Write for catalog and full information.

Dept. 9

MILES MFG. CO., Jackson, Mich.

Standard

Motor Trucks
1, 2, 3½, 5-Ton



STANDARD Motor Trucks as the name implies are constructed entirely of standardized units—units such as the Continental Motor, Brown-Lipe Transmission and Clutch, Timken Axles and Bearings, etc.—every one a leader in its field. Dealers find this principle of standardization especially helpful in closing sales.

STANDARD MOTOR TRUCK CO., Detroit, Mich.

Salesmen Wanted

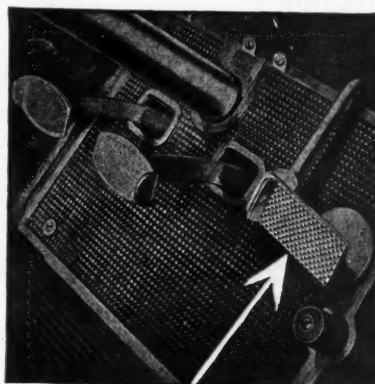
A motor truck manufacturer in Milwaukee needs two additional retail salesmen for local territory. Plenty of prospects to call on—the right men can make real money.

Write in confidence giving age, experience, salary or commission desired and full information about yourself. This company in turn will give you full details regarding the work, the company and its product.

Address Box E-1040, care Motor Age

**HAULS THE
HEAVIEST
LOADS**

**POWERSTEEL
TRUCKLINE**



The Feaster Foot Accelerator Pedal

Adjustable for all cars. A solid, comfortable support that tips sideways. Simply mounted over present throttle. Aluminum with bronze bearing. \$2.50.

**Jobbers and Dealers
Write**

**PETER GRAY
& SONS, INC.**

Sole Manufacturers
Established 1878
BOSTON, MASS.

You Should Carry:—

The ZIP Spark Plug \$1**\$2.00****Safety Connection for Tire Pumps—**

Set it at required pressure—the buzz of the escape valve tells you when to stop. Guaranteed accurate.

Its non-corrosive copper alloy shell will not "freeze" in cylinders or damage their threads

The Hartley Screw Co., 132 Central Ave., Newark, N. J.

See ad next week—or in MOTOR WORLD this week. Liberal Discounts.

SEE PAGE 5**EDWARD A. CASSIDY COMPANY**

A Selling Corporation

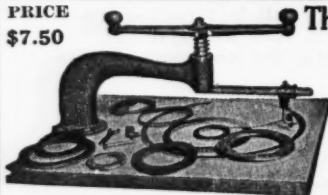
Long Horn G-Piel Muffler Cut-Out

Eccolene G-Piel Pedal

Kimball Auto Jack

Madison Avenue and 40th Street, New York

PRICE

\$7.50**The Springfield Circle Cutter**
FOR CUTTING

Lamp Glass, Sheet Copper and Rubber Gaskets, Felt and Fiber Washers, Etc.

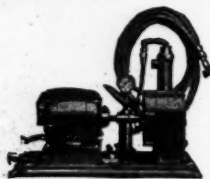
Capacity any size circle from 0 to 14 in. Positive measuring scale to determine sizes. Manufactured by

THE SHAWVER COMPANY
220 Winter St., Springfield, Ohio**The "Long Stroke" COMPRESSOR**

(Write for descriptive folder)

MOTOR-COMPRESSOR CO.

52-60 Dickerson Street, Newark, N. J.

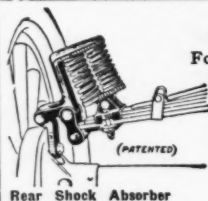
**DISTRIBUTORS WANTED FOR**

Guaranteed for the life of the car

Laurson
HYDRAULIC GEAR SHIFT

EVERYONE WANTS IT

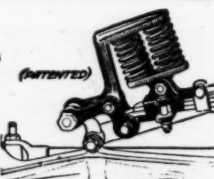
U. S. AUTO GEAR SHIFT CO., 122 S. Michigan Ave., Chicago



Rear Shock Absorber

"CHAMPION" Shock Absorbers
For 'Ford' Cars & Trucks
Four Absorbers in Car Set

WRITE

Champion Shock Absorber Sales Co.
Manufacturers
918 N. Senate St.
Indianapolis, Ind.

Front Shock Absorber

Akron-Williams TIRE REPAIR EQUIPMENT

Preferred and used by the largest tire factories in America. Consult us before remodeling or increasing your facilities.

THE WILLIAMS FOUNDRY & MACHINE CO.

Everything in Tire-Repair Machinery and Tools. Akron, Ohio

Over half the truck tonnage of America is carried on**Firestone TIRES****"Bumpy Way"**
SAGLESS AUTO SEAT CO.**SAGLESS AUTO SEATS**

A new idea in seat construction. No coil springs. Absolutely sagless. Adapted to any car or truck. Attention given to special orders. Upholstered any style. Write today for information.

**"Sagless Way"**
Factory at 2210 S. Wabash Avenue, Chicago**WESTERN****RUNS THE FORD ON KEROSENE**

Dealers—Here is a new big seller with liberal profits that lead to more. Write for free literature and details.

WESTERN CARBURETOR CO.

Alma, Michigan

TRED-WEL LAST-WEL TIRES TUBES

If your trade is showing dissatisfaction with the tire you are selling and if you would like a better selling plan than you have, write to us. We have an attractive proposition on a moderate priced tire.

1002 Michigan Ave. **TWIN RUBBER CO.** Chicago, U. S. A.**EUREKA LINERS PERFECT TRANSMISSION LINERS FOR FORD CARS**

Slidable bands of steel with friction facing or fabric riveted together. Inserted between brake band and drum in a few minutes by anyone. Write for details.

THE EUREKA SALES CO. George Building. Pittsburgh, Pa.**For Ford Cars - The Wheel that Won't Come Off.**

With patented reverse taper construction and hub-cap wedges, wheel positively cannot come off by accident. Safety, beauty and comfort. Saves tires. Quick, easy changes. Set 5 wheels, \$70. Order through Ford dealer. Write for further information or dealer's proposition.

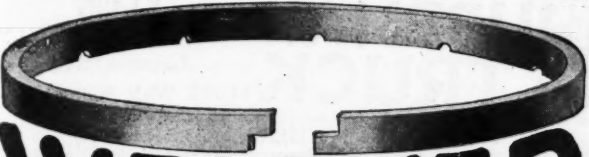
Stewart Wire Wheel Corporation
401-437 W. Barnard St., Frankfort, Indiana, U. S. A.**The Stewart Hub Makes Safety Sure****Link "V" Fan Belt**

A combination of steel, fibre and leather links

The Graton & Knight Mfg. Co.Automotive Equipment Division
WORCESTER, MASS.**Johns-Manville NON-BURN ASBESTOS BRAKE LINING****H. W. JOHNS-MANVILLE CO.**

New York City

10 Factories—Branches in 63 Large Cities



WELEVER

ANTI-OIL-LEAK PISTON RING

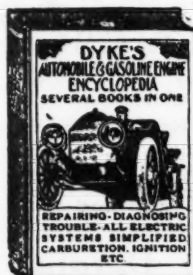
Guaranteed absolutely oil proof, preventing spark plug fouling and carbon formation.

A knife edge lip with groove for gathering oil and outlet passage at bottom of ring allow excess oil to flow back into crankcase through holes drilled in piston ring groove. A saving of oil from 40 to 50% as well as a saving in fuel results because of perfect oil control.

Write for circular giving full particulars, prices, testimonials, etc.

THE WELEVER PISTON RING CO., Inc.
113-19 Superior Street TOLEDO, OHIO

Dyke's 1919 Automobile Encyclopedia



This new book explains the principles of all engines, valves, carburetors, ignition, self-starters—in fact everything you want to know. It shows how to overhaul a car from the ground up, how to make all repairs, etc.

Complete Ford instructions have been included and six, eight and twin six engines and their troubles are indicated so clearly that anyone may understand their operation and repair.

The electrical section of the book is up-to-date and thoroughly treats on the principle, construction, operation and care of the leading electric starting, generating, ignition and lighting systems. Delco, Atwater-Kent, Bosch "Two-Point" and other systems are simply explained.

New material on airplanes and airplane engines are also included.

956 Pages 7 x 10 In., 3362 Figures, Cloth Bound, Price \$5.46 Postpaid
U. P. C. Book Co., Inc., 243-249 W. 39th St., N. Y.

Winton Six

Balance—weight correctly distributed on four wheels—that's why the Winton Six travels steady at all speeds. Its wheels "track" straight, steering is easy, passenger comfort is sure and tires give more miles.

Write today for catalog

THE WINTON COMPANY

424 Berea Road

Cleveland, Ohio, U. S. A.

\$1



EMO TRANSFORMERS

Will Increase the Power Adds Fuel Mileage

For Automobiles, Aeroplanes, Trucks, Tractors, Motorcycles, Motor Boats, Stationary Engines. Insures easy starting, quicker acceleration, and a sturdy, uniform flow of power at all speeds, with greatly added fuel-mileage. Keeps plug points free from carbon. Fits all plugs. Protects entire ignition system. One EMO on each plug makes all cylinders pull even. Guaranteed.

DEALERS—Write for Sales Proposition.

\$1.00 Each at Dealers, or sent prepaid upon receipt of price. State make of car when ordering.

THE EMO LABORATORIES,

2255 N. Illinois St., Indianapolis, Ind.

FREE BOOK

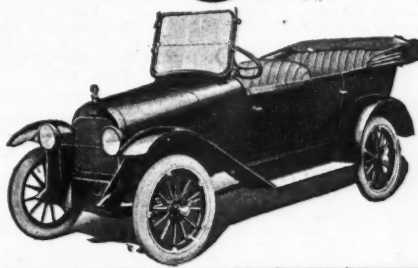
"Care & Repair of Tires"



Tells how to get the utmost mileage from your tires—how to repair cuts, tears, punctures, blowouts, etc., why some car owners get over 15,000 miles from their tires—why sand pockets appear—why oil and water reduce the life of your tires—why spare tires deteriorate—what inflation to give your tires, etc.

This Free Book "Care and Repair of Tires" is just brimful of such tire-saving advice and information. Sent to any car owner on request. Write for it today.

C. A. Shaler Co., 241 Fourth St., Waupun, Wis.



MOORE

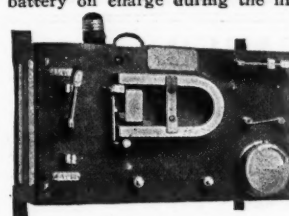
THE WORLD'S BIGGEST LITTLE AUTOMOBILE

MOORE MOTOR VEHICLE COMPANY, Danville, Illinois

FORE RECTIFIER TYPE 2-B

Charges Battery at Cost of 5 to 15 Cents

Will charge two 6-volt batteries at 6 ampere charging rate at one time or four 6-volt batteries at 3 ampere rate or one 12-volt battery at 6 ampere rate. Is self-starting and upon resumption of line current the charging is continued. Entirely safe to put battery on charge during the night. Battery can not be harmed by leaving it on over charge.

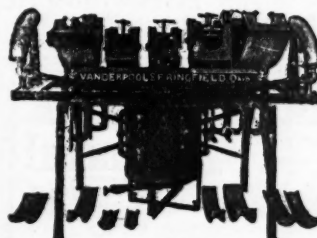


The efficiency of the Fore Rectifier is high so that the current consumed is very small. There is no maintenance expense or depreciation so that the cost per charge is simply for the current put into the battery. Send for prices and illustrated literature.

Kentucky Electrical Co.
Owensboro, Kentucky

COULD YOU HANDLE \$100 A DAY?

REPAIR — REBUILD — RETREAD TIRES the VANDERPOOL WAY. Profits 100% or more.



Small investment. We are the pioneers in the manufacture of the DRY CURE vulcanizer, the vulcanizer that guarantees absolutely PERFECT work. Work easy to learn. If others have been successful, so can you be. Write today for full particulars.

In answering address Dept. N-18

WM. VANDERPOOL CO, Springfield, O.

ANDERSON 6

2- and 5-passenger

Convertible Roadster \$1775

A Fine Line of Touring Car Models

Desirable Dealer Territory Open

ANDERSON MOTOR CO., Rock Hill, S. C.

factory rebuilt tires—

There is now developed a widespread demand among motorists for dependable rebuilt tires. The prices interest both tire users and dealers.

Send for quotations.

OVERLAND TIRE COMPANY

15-25 RIVER STREET

NEWARK, NEW JERSEY

Two Money Makers

FOR FORD DEALERS AND JOBBERS

The DORIC

Rolls-Royce Type Radiator for Ford Cars

"Permanently Beautiful"

Better Cooling, Less Trouble, Longer Life. Write for Proposition

The MOTOR TRUCK RADIATOR & MFG. CO.

2-6 Columbus Circle, New York City

The EMCO

Indestructible Radiator for Ford Trucks

Enormously Popular

Write for Proposition

The MOTOR TRUCK RADIATOR & MFG. CO.

2-6 Columbus Circle, New York City

Starter Steel Ring Gears

For Fly-Wheels of All Cars

These steel bands, or ring gears, are to replace the cast iron teeth of the original fly-wheel. Send in your old fly-wheel and we will exchange or will put a band on yours. Or they can be put on in any machine shop that has a turning lathe.

Write for prices. Advise diameter and number of teeth

KENT AUTO PARTS COMPANY

1743 Logan Street

DENVER, COLO.

Standard Power
for
Automobiles
and Trucks

Continental Motors

Detroit, Mich.

The HUFFMAN TRUCK

\$1495

With Internal Gear Drive

\$1695 With Worm Drive

The Lowest Priced Truck in America for Its Carrying Capacity

HUFFMAN BROTHERS MOTOR CO.

Main Office and Factory, Elkhart, Ind.

Branch and Show Room 2425 Michigan Ave., Chicago, Ill.

HILL 3-A SPARK PLUGS

Dealers—You sell them on our guarantee that they cannot leak compression—short circuit, develop carbon, rust or break. This covers every good point a spark plug can have. Sell them and you sell satisfaction at a good round return for yourself. Price \$1.25 each. Write for the big story.

Hill Spark Plugs Make Good—or we do.

HILL INSULATING & MANUFACTURING CORP., 515 W. 42nd St., N. Y. City



Miss Stewart Custombilt

Are You Reading My Announcements About

STEWART CUSTOM-BILT NECESSITIES?

Appearing
Regularly in this Publication

COE-STAPLEY

**Whirlwind
Tire Pump**

Your customers cannot afford less efficient accessories. To serve their best interest sell the Whirlwind Pump and Peteler Jack

**Peteler
AUTO JACK**

COE-STAPLEY MANUFACTURING CORP.

Sales Office, 136 Liberty St., New York.

Factories: Bridgeport, Conn.

Strom BEARINGS

U. S. BALL BEARING MFG. CO.

(Conrad Patent Licensee)

Palmer Street and Kolmar Ave.

Chicago, Ill.

TABER Tire Dressing Wheel

Equipped with removable blades having two wearing surfaces. Finest tool ever devised for removing dead rubber, for retread and half sole work.

Price \$15.00. Extra blades \$3.00 per set.

Write for circular. Sold by all jobbers.

Manufactured by T. & T. Tire Dresser Co., San Francisco, California.


EXTINGUISHER U. S. FIRE EXTINGUISHER CO.

Syracuse, N. Y.

U. S. A.

Best for Motor Car and Garage Protection.

Price \$2.50

Write for Dealer Proposition. Exclusive territory.

SERVICE-STATION

Install General Storage Battery Service

Under our ironclad twelve months guarantee, backed by the factory, the service station man is selling the BEST BATTERY—with solid assurance to rely upon. No adjustment guarantee to make profits dwindle.

A Square Deal to Every Customer.

GENERAL STORAGE BATTERY CO., 2005 Locust St., St. Louis, Mo.

Full Line of Parts For All Makes of Storage Batteries.

IRONCLAD 12 MONTHS' GUARANTEE



GREB AUTOMATIC GRIP PULLER

BENCH PATENT

There's no chance of this long-armed tool slipping—it grips the work like a vise, adjusting instantly—locking tight. Greb Arbor Press Base and Bench Plate attachment for Senior Puller gives you \$110 equipment for less than one-third that amount. Dealers and Jobbers—Write for our liberal discounts and 10 days' trial proposition.

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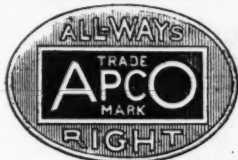
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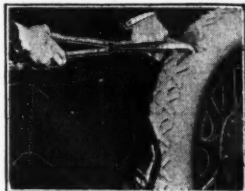
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All in Excellent Condition
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14,000 ft. new radiator hose. Price per ft., 1-in., 15c; 1 1/4-in., 17 1/2c; 1 1/2-in., 20c; 1 3/4-in., 22c; 2-in., 25c.	
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Set of 4 wheels and 5 rims, \$45.00. \$5.00 allowance for old wheels. Demountable Rims for your Ford Wheels 30x3 1/2—Set of 5 with 4 filler hands \$5.50.

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Size	Ribbed Tread	Non-Skid	Size	Ribbed Tread	Non-Skid
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31x3 1/2		12.50	34x4 1/2	25.00	27.50
32x3 1/2	\$15.00	16.00	35x4 1/2	27.50	30.00
31x4		20.00	35x5	30.00	32.50
32x4	17.50	18.50	37x5	32.50	35.00
33x4	20.00	21.00			

10% Deposit Required with each tire ordered
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GENERATORS

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OBTAINED from WRECKED CARS
Mean Economy to You—A Trial
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30x3 1/2	5.50	1.45
31x3 1/2	5.75	1.50
32x3 1/2	6.00	1.50
34x3 1/2	6.50	1.60
31x4	7.00	1.65
32x4	7.75	1.60
33x4	8.50	1.70
33x4 1/2	9.00	1.75
34x4	8.50	1.70
35x4	9.00	1.75
34x4 1/2	9.00	1.75
35x4 1/2	9.25	1.80
38x4 1/2	9.50	1.85
40x4 1/2	15.00	2.50
42x4 1/2	15.00	4.00
44x4 1/2	25.00	4.00
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38x5	10.75	2.20
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Double tread Tires

Selected from best used material obtainable.
Retainers, \$1.25 Extra

Two tires, one with good top and other with good sidewalls are trimmed, cemented and sewed firmly together by Campbell lock stitch method, twelve to fourteen plies fabric making puncture and blowout almost impossible.

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30x3	4.75	3.35	1.50
30x3 1/2	5.80	4.25	2.00
31x3 1/2	6.50	4.50	2.00
32x3 1/2	6.75	5.25	2.00
34x3 1/2	7.00	5.60	2.25
31x4	6.95	5.75	2.50
32x4	7.15	5.65	2.50
33x4	7.80	6.25	2.50
34x4	8.00	6.45	2.50
35x4	8.75	7.15	2.50
36x4	9.40	7.50	2.50
33x4 1/2	9.25	7.60	3.00
34x4 1/2	9.65	8.00	3.00
35x4 1/2	10.15	8.30	3.00

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Guaranteed for 6 Months
6 Volt Starting and Lighting Batteries\$13.50
12 Volt Starting and Lighting Batteries18.50

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In Excellent Condition
Continental Model E.....\$75.00
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Overland 6950.00	
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Chalmers 25-B 6 1915.....100.00	
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UNIT PLANTS

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We bought a carload, all firsts, guaranteed 5,000 miles, not damaged or old stock. Serial numbers and maker's name intact, which will carry factory, as well as our guarantee.

30x3 1/2 rib.....\$12.88	34x4 1/2 rib.....30.06
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Mail orders filled promptly. Cash with order or 25 per cent deposit, balance C.O.D.

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The Original "We Tear 'Em Up and Sell the Pieces"

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13th and Oak Streets

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Bosch D. R. 4	20.00
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Bosch D. R. 6	25.00
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Bosch D. 6	16.00
Bosch D. 6—2 spark	45.00
Eisemann 4 Cyl.	12.00
Mea	10.00
Remy	5.00
Splitdorf	5.00

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Bosch, Type A	\$ 6.00
Eisemann	3.50
Splitdorf	3.50

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Gray & Davis	\$15.00
Delco	20.00
Jones Starter & Gen.	17.50
Apple Starter & Gen.	20.00

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FOR ALL CARS

New Gears and Shafts for 200 Cars
PREST-O-LITE TANKS MODEL B, \$4.00; MODEL E, \$3.00
Searchlight Tanks, \$2.00

New Bosch D U 4 Variable, \$32.50. Write for special quantity prices.

EXCELLENT 2ND HAND TIRES AND TUBES

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5% Off for Cash *WRITE FOR PRICES* Deposit Required
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All Makes and Sizes
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All Parts for 2 Cyl. Gradowsky Trucks.
Front and Rear Axles,
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Transmissions — Universal
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Bearings — All makes and
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TRANSMISSION AND
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FOR OVER 100 DIFFERENT MAKES OF CARS

BEVEL DRIVE GEARS FOR THE FOLLOWING CARS

Abbott	Cole	Enger	Holler	Little "6"	Moon	R. C. H.
Allen	Crow	Everitt	Hudson	Madison	National	Regal
Alter	Crow-Elkhart	Flanders	Hupmobile	Marion-Handley	Olympian	Ross
American	Cutting	Gilde	Imperial	Mason	Oldsmobile	Saxon
Anderson	Davis	Grant	Interstate	Maxwell	Palge	Scripps-Booth
Apperson	Detroit	Great Western	Jackson	McFarlan	Palmer-Singer	Staver
Auburn	Dixie Flyer	Halladay	Jordan	McFarlan	Partin-Palmer	Stoddard-Dayton
Bour Davis	Dort	H. A. L.	King	McFarlan	Patterson	Studebaker
Buick	Drexel	Mayers	Krit	Michigan	Pathfinder	Vellie
Case	Elcar	Maynes	Lexington	Mitchell	Premier	Warren-Detroit
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REAR AXLE SHAFTS

FOR MANY
MAKES OF CARS

Prompt Shipments. Money Refunded on Parts Not Used, If Returned Within Ten Days. Liberal Discounts to Jobbers, Dealers, Garage and Repairmen
THE ABOVE IS ONLY A PARTIAL LIST. WRITE US YOUR NEEDS

AMERICAN GEAR COMPANY

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Save 35% to 80%

Here's a partial list of cars for which we have parts. If the name of your car is not listed send us the part and we will duplicate, as we are daily buying and wrecking cars. We absolutely guarantee to return parts at our expense that can not be duplicated.

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Auburn	Clark	Ford, Model S	Knox	Maxwell	Parry	Regal Underslung	Thomas-Detroit
Auto Car	Cole	Great Western	Krit	Marathon	Parry-Knight	Reo	Thomas Six
Avery	Columbia	Haynes	Leader	McFarlan	Pathfinder, 4 and 6	Richmond	Waverly Electric
Brown	Continental	Henry	Lexington	Mitchell	Peerless	Sampson	Wayne
Brush	Cutting	Herreshoff	Little	Nyberg, 4 and 6	Pierce-Arrow	Service	Westcott
Buick	Davis	Hudson	Locomobile	National	Pilot	Silent Knight	Winton Six
Cadillac	De Tangle	Hupp	Loier	Oakland	Pope-Hartford	Speedwell	Zipp
Carnation	E. M. F.	I. H. C.	Lyons Knight	Oldsmobile	Premier, 4 and 6	Standard Electric	
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Our stock of parts is large and complete. Our service is as good as you will find anywhere. All our goods are sold on a money back guarantee. Give us a trial.

We Specialize In Parts For:

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Special Bargains In Magnetos

Bosch, high tension, D4	\$18.00
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Write for Bargain Bulletin

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We have an enormous stock of all makes and sizes of demountable rims and wheels—have them right in stock and can make immediate shipment.

Write for Prices

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Brand-new Honey Comb radiators for all makes of cars; guaranteed to be right. No matter what car you may need a radiator for, write us for prices.

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New Springs for all cars. Write for Prices

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One-man Khaki tops for Maxwell touring cars, with curtains and dust boot	\$25.00
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Sporty racing type bodies with top and shields	120.00
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—FOR—

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SPECIAL—Garage and Repairmen—Our new Bulletin of Used Parts and Prices is now ready for you. With this Bulletin in your shop you can supply repair parts for all makes and models of cars listed and increase your repair business. It is free. Write for it today.

SERVICE—Every inquiry will receive prompt attention. Orders shipped same day received. Satisfaction guaranteed or money refunded.

Auto Parts Company
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New OVERLAND MOTOR PARTS 83B and 85-4

Purchased from British War Mission—400 BRAND
NEW 83B and 85-4 Block Motors

Complete motor with clutch and fly wheel.....\$150.00
With Bosch DU-4 magneto, Autolite generator
and starter.....215.00

We can furnish any part for these motors at 25 per cent to 40 per cent saving—note some of these prices:
Cylinder block.....\$24.50
Fly wheel.....12.50
Cone clutch assembly.....15.00
Crankshaft.....16.50
Crankcase (lower).....16.50
We can furnish Pistons, Rings, Connecting Rods, and all motor bearings, timing gears, or any part of these motors. Write us for prices.

ALSO BRAND NEW

Bosch DU-4 variable spark magnetos	\$29.50
Simms SU-4 magnetos	15.00
Axle shafts for any model Overland or Studebaker	3.25
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All orders shipped C.O.D. Subject to your inspection.

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Tops and Upholstering
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SAVE 35% TO 90% ON AUTO PARTS

New Ring Gears, Pinion Gears, Axle
Shafts and Springs for most any make
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BARGAINS IN NEW SPRINGS

Overland 75-90 Rear.....\$8.00

Ford Fronts.....2.50

Ford Rear Springs.....6.75

Parts Carried in Stock for Almost All
Cars

FOLLOWING IS PARTIAL LIST

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American	Hupmobile	Palmer-Singer
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Atlas	Jackson	Peerless
Auburn	Kissel	Pope Hartford
Bimel	Knox	Premier
Buick	Krit	Rambler
Cadillac	Argo	R C H
Carter Car	Lyons-Knight	Regal
Case	Little	Reo
Chalmers	Marmion	Schacht
Chevrolet 4-90	Matheson	Speedwell
Cole	Maxwell	Stoddard-Day-
Elmore	Michigan	ton
E M F 30	National	Studebaker—
Everett 30	Nyberg	all models
Firestone	Oakland	Thomas Detroit
Flanders	Oldsmobile	Warren
Ford	Overland	Winton
Great Western		

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PARTS, ACCESSORIES, AND SUPPLIES NEW AND USED

We have ready for immediate shipment a
large stock of Magnetos, Carburetors, Com-
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Anvils, Spark Plugs, Electric Motors, Fuel
Tanks, Vises, Speedometers, Lenses, etc., etc.
We furnish everything for the motor car at
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What do you need? Let us send you special
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See what you can save.

Write today

Auto Parts Co.

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Big Reduction in four and six cylinder
Cole parts.

Wire or write

I. WOLF AUTO PARTS & TIRE CO.
"A MILLION PARTS"

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PATHFINDER OWNERS

Buy your repair parts direct from
the manufacturer of your car.

We carry a complete stock of repair parts and can make shipment the day order is received. Our stock includes a complete supply of Weidely 12-cyl. motor parts.

THE PATHFINDER COMPANY, Indianapolis, Ind.

Parts and Repairs

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Don't pay a premium for, nor run the risk of using, second-hand parts when you can get NEW PARTS, exact duplicates made from original patterns, by ordering direct from the factory that built your motor.

Deal with headquarters and be assured of good reliable parts at a fair price.

WEIDELY MOTORS COMPANY**Indianapolis, Ind.****Build Your Own Car**

100 Pressed Steel Frames, new.....	\$ 15.00 each
125 6-Cylinder Motors, new.....	150.00 each
90 Bell housing Transmissions with lever set.....	45.00 each
200 Sets Wood Wheels with Demountable rims, per set.....	25.00
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200 Windshields, many different kinds.....	6.00 each

Send for list of other parts.

SPECIAL NOTICE

On September 15th we expect all tires to raise 20 per cent. While our stock lasts we will sell these at the old price. Send for Bargain Sheet.

Auto Auction Co.
726-728 W. Jackson Boulevard
Chicago

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805-809 W. Douglas Ave.

EXCEPTIONAL VALUES IN MOTORS

We have parts for the following cars:

American Underslung	McFarland Six
Auburn 30-40	Marathon 30-40
Buick F-10-16-17-19-25-28-29-30-31	Marmon 30—Rear axle & transmission
Burg 40	Maxwell 2 & 4 cylinder; K-Q-25—Mitchell 40
J. I. Case 40	Moon 40
Carter Car 5A-L-R	Mason "May Tag" 4 cyl.
Chalmers F-K-L & Six 10-11M-18—Clark 40	Monarch 40—Moline
Cadillac 1909-1910	Monroe
Cameron—Crawford	Overland 30-32-35-38-41-42-52-56-59-69-71-75DR-79-81-83
Detroit—Enger 40	Oldsmobile 40
E. M. F. 30—Pal car	Oakland 2 & 4 cyl. 30-40
Flanders 2 & 3 speed	Packard 1910—Premier
Firestone Columbia	Paige Detroit 25 H. P.
Fuller	Pullman 40
Ford—N. R. & S.	Pao 2 & 4 cyl. 4th & 5th
Great Northern	Rider Lewis—Sellers
Halladay—Haynes 1910	Rambler 31-40-44-52
Herreshoff—Hupp 20	R. C. H.—Regal 30
Hudson 20	Stoddard Dayton 40
I. C. H. 2 & 4 cylinder	Studebaker 14-25-35
Jackson 2 & 4 cylinder	Velle 30-40
Olympic-Majestic 45-50E	Winton Six
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Complete Motors, Transmissions and Rear Axles. Money refunded on all parts within 10 days if unsatisfactory.

Buy Your Parts in WICHITA, KANSAS

Speed or Power

for the Ford or Chevrolet 490.

INSTALL A SET OF:

- 234—1 Gears in the Race Type
- 3—1 Gears in the Roadster
- 4—1 Gears in the Delivery or Taxi

OUR TRADE MARK—A star on every gear insures quality

All ratios \$15.00 set.

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USED PARTS

We have one of the largest and most complete stocks of used parts from 50 to 75 per cent off manufacturer's list price. We have new axle shaft ring gears and pinions for all makes of cars.

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Auto Salvage & Wrecking Co.**PARTS**

ALWAYS TEARING 'EM UP—AND SELLING THE PIECES

YES!
PARTS FOR
ALL CARS

Magnetos,
Gears, Motors,
Transmissions

Radiators,
Axels
'n Ever'thing

ALSO TIRE
BARGAINS
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OKLAHOMA CITY, OKLA.**AUTO PARTS**

Save 50-90% for 400 Cars

1910-1919 Buick, Cadillac, Dodge, Studebaker, Pope, Packards, Pierce, Etc.

Motors	\$25.00 up	Presto Tanks ...	\$ 4.50 up
Magnetos	4.00 "	New Spotlights. 2.00 "	
Carburetors	3.00 "	Generators	10.00 "
Rear Axles	15.00 "	Gears	1.00 "
Front Axles	5.00 "	Bearings	1.00 "
Cylinders	5.00 "	Radiators	10.00 "

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BRIGHTMAN AUTO EXCHANGE

321 Windsor Ave. Hartford, Conn.

Largest Exchange in New England

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TOP RECOVERINGS
BACK AND SIDE CURTAINS
SEAT COVERS

For All Cars

SPECIALS FOR FORDS

Complete Roof and Back, Ready to Put On
Roadster \$8.75
Touring 11.60
ONE MAN Touring Tops, complete..... 36.00

SEAT COVERS

Roadster \$6.75 Touring \$11.00

GENERAL OF SPECIAL FORD CATALOG

Sent Free Upon Request

SPECIAL DISCOUNTS TO DEALERS

ATLANTA AUTO TOP AND TRIMMING COMPANY

153 Edgewood Ave., ATLANTA, GEORGIA

Brand New Parts

Including Transmission Gears, Differential Gears, Axles, Universal Joints, Clutch Linings and Parts, Cylinder Head Gaskets, etc. Lowest prices consistent with quality and

A GUARANTEE

with every part shipped. Complete satisfaction or your money refunded in full.

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1623 McGee Street Kansas City, Mo.

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ALL KINDS OF RIMS
New Style—Old Style—Obscure—Parts of Rims—Pieces of Rims—Straight Side Rims—Q. D. Rims—Climcher Rims—New Rims—Used
GRAY'S AUTO GARAGE CO.
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We Are Rim Specialists and Experts

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Just Write
Newton's Auto Salvage
When you are in the market for Anything for the Automobile
New and Used
Gears—Axles—Bearings—etc.
FORD—
Speedster Bodies \$ 65.00
Cloverleaf Bodies 233.00
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Write for particulars
The Cut Rate
Accessory Store
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A BUSINESS OPPORTUNITY

Nearly every Dealer, Garage and Repair Shop has several hundred dollars worth of stock on hand that is "dead"—working capital tied up to stay—unless an effort is made to turn it into ready cash. Some one somewhere needs just what you have—obsolete parts, out-of-date or overstock accessories, out-of-style bodies, etc.

MOTOR AGE'S Clearing House Service Department can help you dispose of this. It brings buyer and seller together. Send a list of what you have and let's talk it over.

MOTOR AGE

Clearing House Department

Mallers Building Chicago, Ill.

Write For PARTS For the following Cars

Abbott-Detroit	Flanders 20, 2 & 3 speed	Moline 10 M35
E44 B	Franklin-10	Oakland 25-35
Brush	Gay Truck model G 1914	Overland to 16
Buick to 16	Hudson-20-33	Rambler 10
Cadillac-10	Hup 20	Regal—all models
Chalmers-36	Imperial 34	to 13, underslung 29 & 25
Model 17	Jackson 52	Reo to 16
Chevrolet Royal	Kissel Kar 10	Saxon Baby 4
Mail & 490	LD 11	Stoddard-Dayton
Cole-30 and 1914	Krit 20	H10
Series 9	Metz 22	Studebaker 13
Cutting-12	Maxwell to 15	Velle 32
Detroit-13A	Mitchell to 16	
E.M.F.—all models		
Empire 31		

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CRAIG-HUNT Parts are the safest and BEST COMPLETE SET, for lowering the Ford Frame
\$25.00

We make 16 valve Racing Heads, Racing Bodies, Pistons and counterbalances for the Ford

CRAIG-HUNT, Inc.

910 North Illinois Street, Indianapolis, Ind.

Lozier Owners—Why buy counterfeit repair parts? We have all Original Parts. Made from original patterns. Orde. from headquarters.

LOZIER MOTOR COMPANY
FORT AND 6th STREETS, DETROIT, MICH.

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SPEEDWAY BODIES for FORDS

\$100 Underslung parts with body free, or parts alone, \$12.50 per set.

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Parts and Repairs
Tires**RIMS ALL WHEELS**Pneumatic Tire Wheels for Ford Trucks.
Five Detachable Wire Wheels for Fords.
Complete Catalogue on Request**CHICAGO WHEEL & RIM CO.**
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Tires**Hupp 32 & EMF Parts**160 DIFFERENT MAKES CARS in PARTS
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PROMPT ATTENTION**UNITED AUTO WRECKERS**
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Tires

40% OFF

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**5000 Mile
Guaranteed**

Standard Brand

T I R E S**ARMSTRONG GREY TUBES**

Guaranteed for One Year

OUR PRICES

Size	Ribbed	Non-Skid	Tube
30x3	\$9.12	.....	\$2.00
30x3½	11.76	\$12.39	2.45
32x3½	13.89	14.55	2.55
31x4	18.15	19.05	3.20
32x4	18.48	19.38	3.35
33x4	19.29	20.22	3.45
34x4	19.77	20.73	3.55
35x4½	27.84	29.16	4.45

10% deposit required with order, balance C. O. D., subject to examination.

Special proposition to dealers.

The Armstrong Tire Co.

1342-44 Michigan Ave., Chicago, Ill.

Phone Calumet 5212 and 2199

T I R E S & T U B E SSLIGHTLY USED AND FACTORY REPAIRED
T I R E S AND NEW TUBES—QUALITY ABOVE ALL

The QUALITY of our tires and tubes is superlative, the PRICE cannot be equaled and our SERVICE cannot be excelled

A SATISFIED CUSTOMER IS OUR BIGGEST ASSET, THEREFORE.**WE MUST SATISFY YOU**

Size	Used Tire	New Tube	Size	Used Tire	New Tube	Size	Used Tire	New Tube
30x3	\$4.00	\$1.95	32x4	\$7.25	\$3.05	35x4½	\$8.75	\$4.25
30x3½	5.00	2.30	33x4	8.00	3.25	36x4½	9.00	4.40
32x3½	5.50	2.40	34x4	8.00	3.40	35x5	9.75	4.60
34x3½	6.00	2.60	35x4	8.25	3.50	36x5	9.75	4.70
31x4	6.50	3.00	34x4½	8.50	4.15	37x5	10.00	4.75

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly, with privilege of examination, and balance C. O. D. Specify style of rim to avoid delay.

Our Used Tires are not guaranteed for any definite number of miles, but we will make reasonable adjustments on all tires that do not give service in proportion to the price paid, providing tires are returned to us by prepaid express. Is not this fair enough?

**WE CARRY A COMPLETE STOCK OF NEW TIRES—
WRITE FOR PRICES.****LINCOLN TIRE & SUPPLY CO.**

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Broadway Tire Jobbers**Jobbing****America's Best Make****S E C O N D S**

Surplus and Obsolete Stocks

**Our Prices Will Interest You
Why Not Write Us NOW?****BROADWAY TIRE JOBBERS**

250 West 54th Street NEW YORK

You can't TIRE us asking quotations**No Deposit Required
ON OUR TIRES****Demonstrating****All Non-Skid TIRES All Non-Skid****They Are MUCH BETTER
Than the Ordinary Used Tires**

Size	Tire	Tube	Size	Tire	Tube
30x3	\$ 6.50	\$1.75	33x4½	13.50	2.50
30x3½	7.50	1.90	34x4½	13.50	2.60
32x3½	9.00	2.00	35x4½	14.00	2.65
31x4	9.50	2.15	36x4½	15.00	2.75
32x4	10.50	2.15	38x4½	22.00	.....
33x4	11.50	2.25	35x5	15.50	2.85
34x4	12.50	2.35	37x5	16.50	2.95
32x4½	13.00	2.35	37x5½	18.00	.....
			38x5½	25.00	.....

5 Per Cent Off for Cash in Full with Order. Otherwise, goods shipped C. O. D., subject to examination. Specify whether clincher or straight side.

Royal Tire & Supply Co.

1461 Michigan Avenue CHICAGO, ILL.

**CORD & FABRIC
T I R E S**

We carry the Largest Stock of all Standard Makes of Guaranteed Tires in the State.

We can offer you a saving on Solid and Pneumatic Tires.

May We Quote You Prices?**ACORN TIRE & RUBBER CO.**

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TIRE REPAIRMEN

Etc. Sell Double Tread Tires. Our quality and prices will make money for you.

Write us for proposition and prices
STATE RUBBER TIRE CO.Dept. M. A. Chicago, Ill.
126 E. 33rd St.**DEALERS—MANUFACTURERS**We Are in the Market
For New or Obsolete

stocks of high-grade tires, tubes and accessories. Will make you a mighty attractive proposition.

Address Box E-1029, care Motor Age.

HAVE YOU TIRES TO SELL

Ask us about reaching a Responsive Market for you.

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Tires
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Tires
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Rebuilding and Repairing

Over One Hundred Thousand Dollar Stock of HIGH GRADE TIRES

Which were slightly blemished in the manufacture. These blemishes do not, in any way, interfere with the wearing quality of these tires, but are simply sold without our regular 5,000-mile guarantee.

Just order a few of these high-grade tires, and if, when you receive them, they are not entirely satisfactory to you, return them to us immediately and we will cheerfully refund your money, providing the tires have not been used. These Tires are the best trade builders any dealer could buy. Don't let an opportunity of this kind slip through your fingers. **ORDER TODAY**, while our stock is complete and you can get any size you may need.

PRICES TO DEALERS ONLY

Non-Skid	Inner Tubes	Non-Skid	Inner Tubes	Non-Skid	Inner Tubes
28x3.....\$ 9.00	\$1.95	32x3 1/2.....\$12.50	\$2.70	34x4.....\$17.40	\$3.65
30x3.....8.50	1.95	31x4.....16.05	3.35	35x4 1/2.....24.10	4.50
30x3 1/2.....10.75	2.50	32x4.....16.30	3.45	35x5.....27.40	5.25
31x3 1/2.....11.30	2.60	33x4.....17.05	3.55	37x5.....28.10	5.50

TERMS: 10% deposit and we will ship balance C. O. D. Orders Filled Same Day Received

BUCYRUS TIRE & RUBBER CO. of ILLINOIS
1406 Michigan Avenue Chicago, Ill.

Phone Calumet 1380

TIRES AND TUBES

SLIGHTLY USED TIRES

OBTAINED FROM WRECKED CARS AND
FACTORY REPAIRED

Size	Tires	Tubes	Size	Tires	Tubes
30x3....\$ 4.50	\$1.35	34x4 1/2... 9.00	1.75		
30x3 1/2... 5.50	1.45	35x4 1/2... 9.25	1.80		
32x3 1/2... 6.00	1.50	36x4 1/2... 9.50	1.85		
31x4.... 7.00	1.65	38x4 1/2... 15.00	2.50		
32x4.... 7.75	1.80	40x4 1/2... 15.00	....	
33x4.... 8.50	1.70	42x4 1/2... 25.00	4.00		
34x4.... 8.50	1.70	36x5.... 10.25	2.00		
35x4.... 9.00	1.75	37x5.... 10.75	2.20		
33x4 1/2... 9.00	1.75	38x5 1/2... 15.00		

ADD 10% FOR NON-SKID
\$1.00 Deposit Required With Each Tire Ordered, Balance
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1	32x3	High Grade	Cl. New	20.00	12.00	
1	31x3 1/2	High Grade	Cl. New	23.00	15.20	
2	32x4	High Grade	Q. D. New	33.00	19.80	
8	32x4	High Grade	Q. D. New	42.10	25.25	
1	40x4	High Grade	Q. D. New	40.00	24.00	
4	32x1 1/2	High Grade	Cl. New	65.45	39.27	
1	32x4 1/2	High Grade	Q. D. New	48.80	29.28	
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30x3 1/2.....5.85	1.70	31x4 1/2.....9.60	2.50		
32x3 1/2.....6.35	1.80	36x4 1/2.....9.85	2.50		
34x3 1/2.....7.50	1.90	36x4 1/2.....10.35	2.50		
31x4.....7.35	2.10	37x4 1/2.....11.00	2.50		
32x4.....7.60	2.20	35x5.....11.10	2.50		
33x4.....7.85	2.25	36x5.....11.35	2.00		
34x4.....8.10	2.35	37x5.....11.60	2.60		
35x4.....8.50	2.40				

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